electrical contracting

With which is consolidated The Electragist and Electrical Record
Established 1901

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NOVEMBER, 1938

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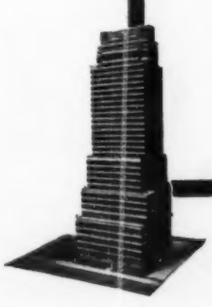

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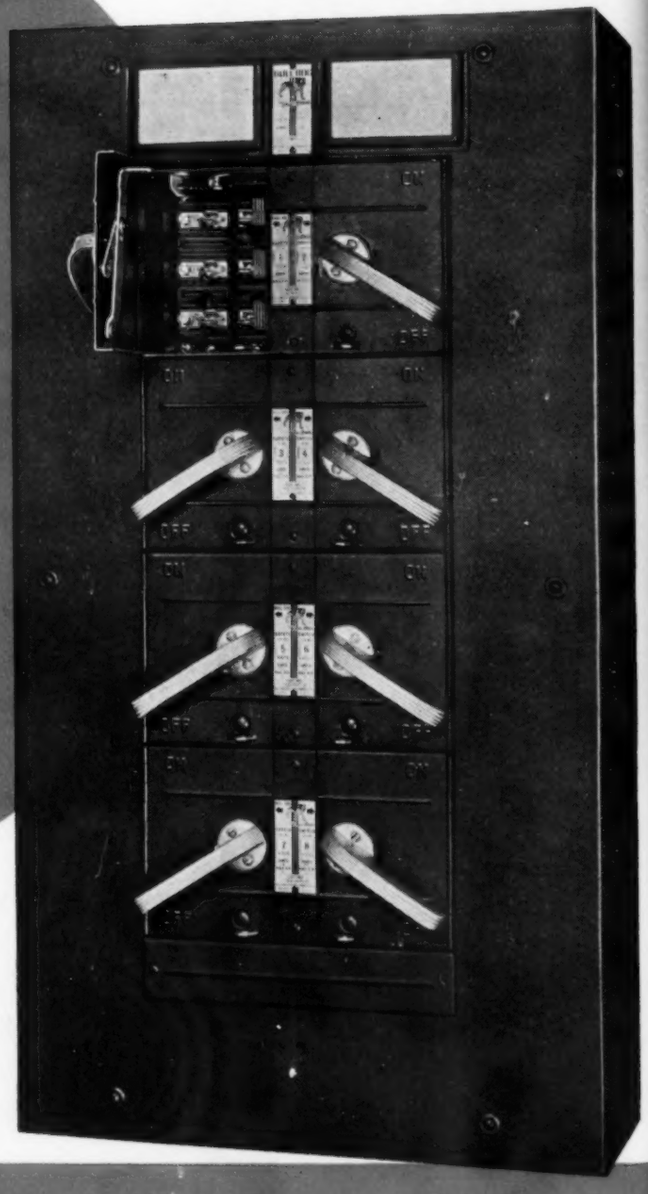

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electrical contracting

NOVEMBER, 1938

Our Big Idea

SOME STRONG IDEAS HAVE SWEPT ACROSS AMERICA. First it was the idea of freedom—from 1620 till the Revolution. Then it was the idea of self government. Then it was free land and the conquest of the west. Then it was zeal for scientific development and industrial expansion, to raise our standard of living. Each in turn, these ideas have dominated the American scene.

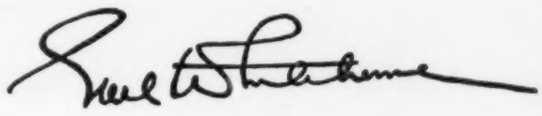
OUR BIG IDEA TODAY IS SECURITY. That means a good job for the working man and fair dealing—both ways—an end to strife between labor and management and the turmoil of industrial warfare. Make no mistake—this idea has become as compelling as any of the others that have captured public interest and changed this nation. And every man of us is in it up to the ears and will be swept along.

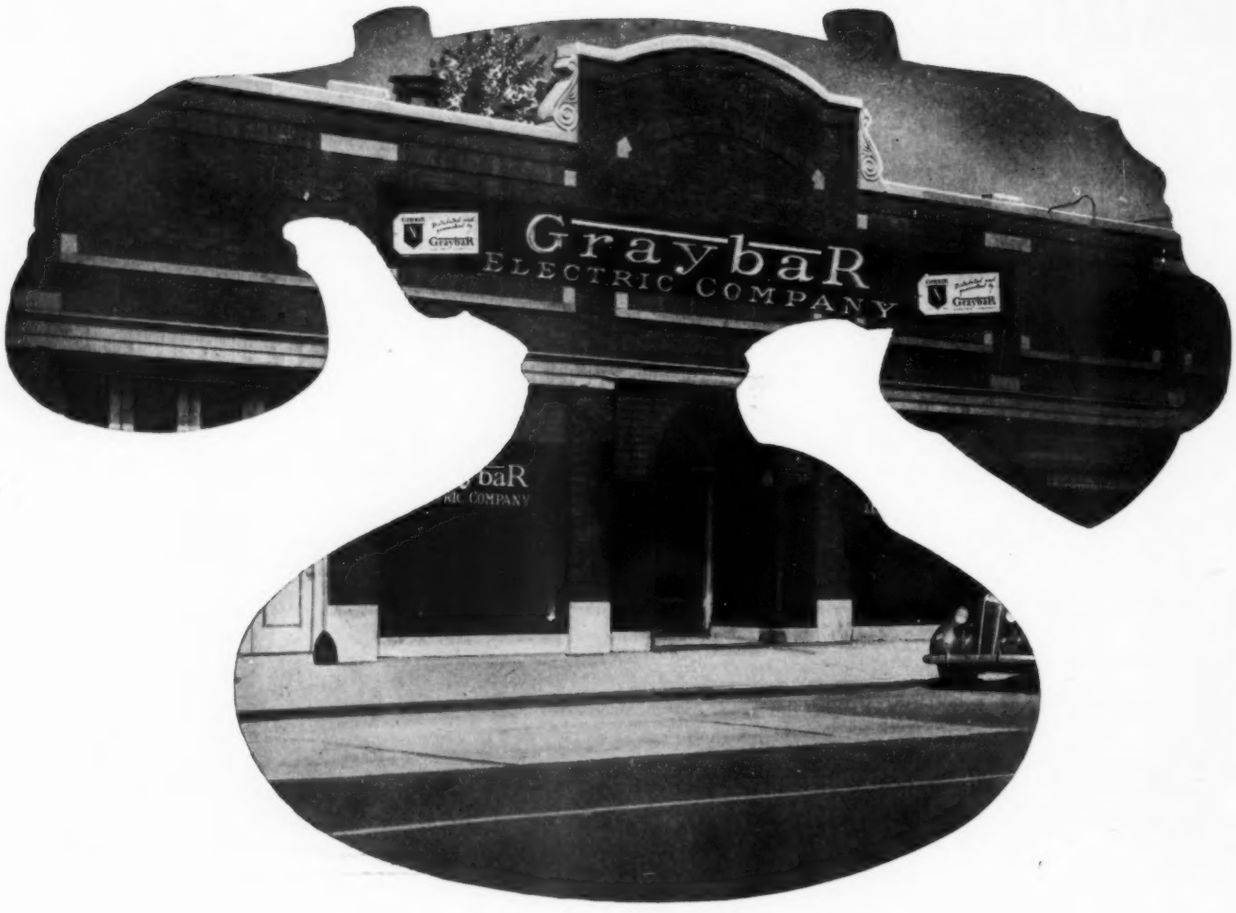
THE CONTRACTOR IS INVOLVED IN TWO WAYS. The biggest present problem in every factory is how to better working conditions for the employee. And that brings opportunity to sell to every industrial customer—better light, air conditioning, more effective control—all these things we have been calling "modernization." Sell them now to help satisfy this pressing need. But that's not all.

EVERY CONTRACTOR ALSO HAS HIS OWN EMPLOYEES and what of them? "Oh, they're all right! I know my men," you say, or "The union rules take care of that." But your success depends not on the union rules nor on your personal ability alone. Your work, your profit, your standing in the trade, your reputation with the public hang upon what these men do, day by day—all in your name—how well they work for you.

IT MAKES NO DIFFERENCE whether you're a union shop. A new relationship between labor and management is evolving. Its influence is bigger than you are and your men know it. But—do you? Are you helping guide this change—adapting your old methods to conform and capitalize the new conditions?

EMPLOYEE RELATIONS, PUBLIC RELATIONS, PROSPERITY—it's all rolled up today in one round ball. NECA has recognized it with its new labor section. The problems involved for contractors should be under discussion in every city—getting it clear and straight—working out plans. For it's another social revolution—like those of Jefferson's and Jackson's times. And the important thing is to see it coming, know your place in it, help steer it past the rocks.





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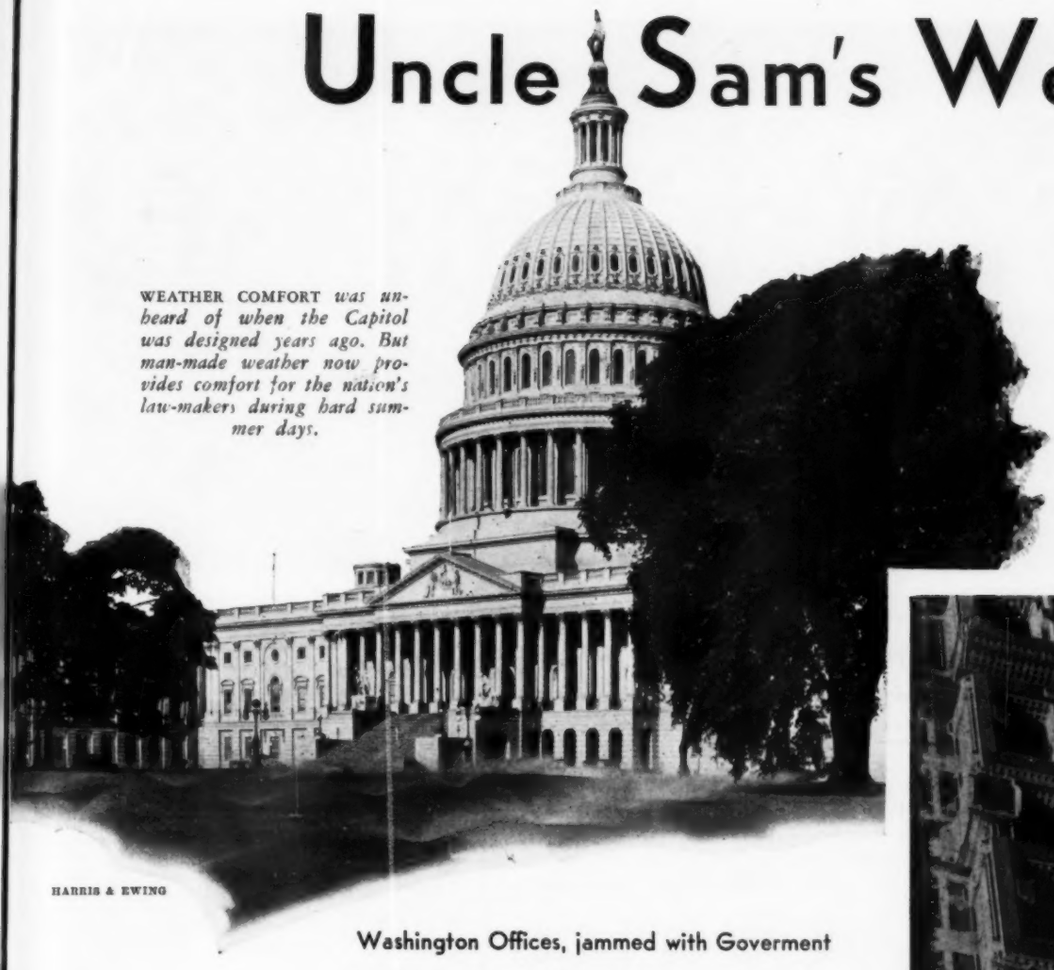
Uncle Sam's Weather

By
Frank J. Seiler



WEATHER COMFORT *was unheard of when the Capitol was designed years ago. But man-made weather now provides comfort for the nation's law-makers during hard summer days.*

HARRIS & EWING

Washington Offices, jammed with Goverment workers, present the world's largest weather making task. Here are some of the big installations, wired by electrical contractors.

SUMMER days in Washington are now comfortable for office workers, despite the Capitol's reputation for hard weather. For most of the huge government structures, housing thousands of officials, technicians and clerks, have been air-conditioned. It is a large-scale example of man-made weather. And this means big values—the greatest concentration of air conditioning in the world—we are told by experts.

Government buildings buy power for operating about 30,000 horsepower in air conditioning equipment. Some generate their own power for another 11,000 horsepower. Washington's stores and other business concerns account for an additional connected load of about 20,000 horsepower. And it must all be blamed on the local weather, plus the rapid trend toward keeping workers comfortable throughout the year.

Meteorologists explain Washington's weather as a "temperature rain climate", marked by high humidity, long-continued and sometimes oppressive heat in summer, as on July 20, 1930, when 105.6 deg. F. was recorded. Washington has had temperatures of 90 deg. or warmer as early as March 22nd, also as late as October 11. Rainfall averages 40.28 inches per year. July is usually the wettest and hottest month, with average rainfall of 4.16 inches and an average maximum temperature of 86.6 degrees and there are usually ten days when it is 90 or above. In August, the relative humidity reached 86 percent at 8 A.M., receded to 62 percent at noon, and reached 72 percent at 8 P.M. So the efforts of men and machines to re-

INTERNATIONAL

POWER LOADS *in Uncle Sam's huge air conditioned buildings run high. Experts say it is the world's greatest concentration of weather-making facilities.*

CLASSIC STRUCTURES *recently added to Washing's array of bureaus and departments have employed coordinated designs for weather-making. Here is the Federal Reserve Board's marble-faced home.*

WASHINGTON'S WEATHER MAKING CAPACITY

Here are some of Uncle Sam's air conditioned buildings, and what they required to provide comfortable indoor weather.

Name of Building	When Installed	No. of Motors	Approx. Total H.P.	Air Conditioning Tonnage	Air Conditioning Cubage
					cu. ft.
Dept. of Justice	1934	80	3,000	1200	16,328,400
Interstate Commerce and Labor Building	1934	90	3,300	1500	15,132,740
Post Office Dept. Bldg.	1934	90	3,200	1700	9,996,000
North Interior Bldg.	1935	100	2,900	1200	7,701,271
South Interior Bldg.	1936	120	4,250	1920	14,391,300
Archives Bldg.	1935	80	2,750	1000	12,043,000
Agricultural Adm. Bldg.	1935	50	1,450	750	3,384,000
Federal Reserve Bldg.	1937	30	900	400	3,661,000
Treasury Dept.	1935	75	1,600	820	5,000,000
White House Exec. Offices.	1934	15	275	115	375,000
Federal Trade Commission	1938	40	1,100	600	3,333,000
Federal Home Loan Bank	1937	45	1,200	750	3,066,000
Court of Appeals	1937	17	160	114	358,000
U. S. District Court	1937	35	450	250	775,000
U. S. Capitol	1937	75	*2,340	1464	Not available
Senate Office Bldg.	1937	67	*2,540	1585	Not available
Old House Office Bldg.	1937	53	*2,108	1355	Not available
New House Office Bldg.	1937	65	*2,130	1332	Not available
Library of Congress Annex	1937–38	106	1,440	900	Not available
U. S. Supreme Court	1934–35	—	598	374	Not available

*** The refrigeration equipment for most of the load for these four buildings is located in the Capitol Central Power Plant. Six 800-ton freon compressors are each driven by a 1000-hp motor.**

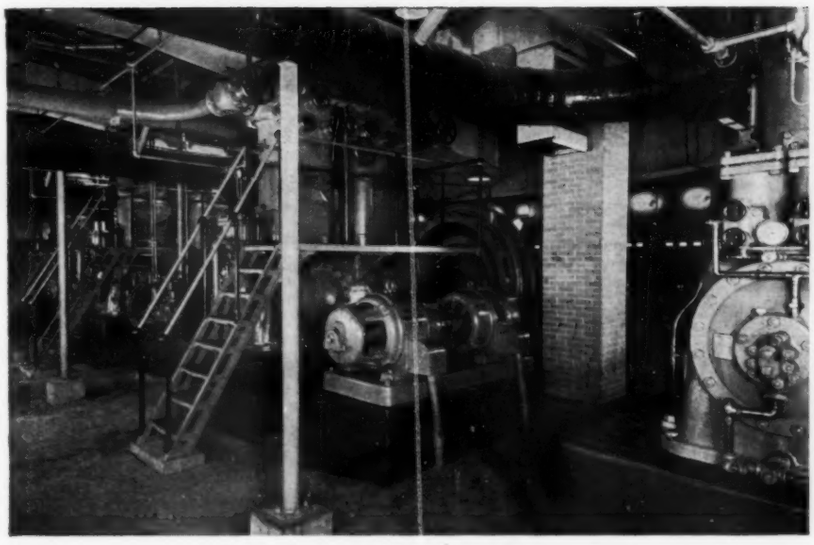
duce all these climactic peaks to terms of comfortable weather has imposed a gigantic engineering and equipment job upon the custodians of Washington's government structures.

To provide a quick evaluation of how much air conditioning it takes, and in how many structures it is used, to make Uncle Sam's weather, the accompanying summary has been prepared of the prinicipal systems now installed at Washington. All of this meant big wiring jobs, large motors to handle, and complicated control switchboards to design and install. Elaborate boards for gauges, instruments and remote control devices were employed. In addition, the heavy compressors, pumps and fans increased transformer and switchgear capacities. In most cases, all of this additional electrical equipment was engineered in coordination with the general building requirements for lighting and general motor loads. All of the work was done by electrical contractors, working directly for various governmental departments, or in some cases as subcontractors under a general air conditioning installation contract.

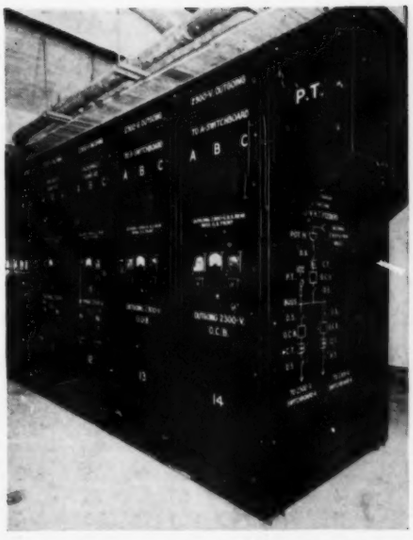
From the standpoint of equipment design and installation methods, Washington's air conditioning employs most of the late refinements as well as excellent workmanship. Most of the systems were installed since 1934. In the Legislative group—the Capitol, House and Senate office buildings and Library of Congress—air conditioning went in during 1937.

Some of the construction details are worthy of mention. For instance, the larger buildings that were recently constructed use 2300-volt supply for larger motors on compressors, pumps and fans. These buildings are usually supplied with two or more primary underground service cables at 13,800 volts, 3-phase, 60 cycles. The services are terminated in metal-clad cubicles where metering devices, oil circuit breakers and feeder transfer switches are housed. From these cubicles the various feeders are taken to two kinds of load centers.

One set of 13,800-volt feeders supplies the 13,800/2300 transformers, while another network of 13,800 volt feeders supplies the various 13,800/120-



MACHINERY LAYOUTS *for compressors, pumps and condensers vary with tonnage, structural conditions, and types of apparatus provided. This compact layout is in the Federal Archives Building.*



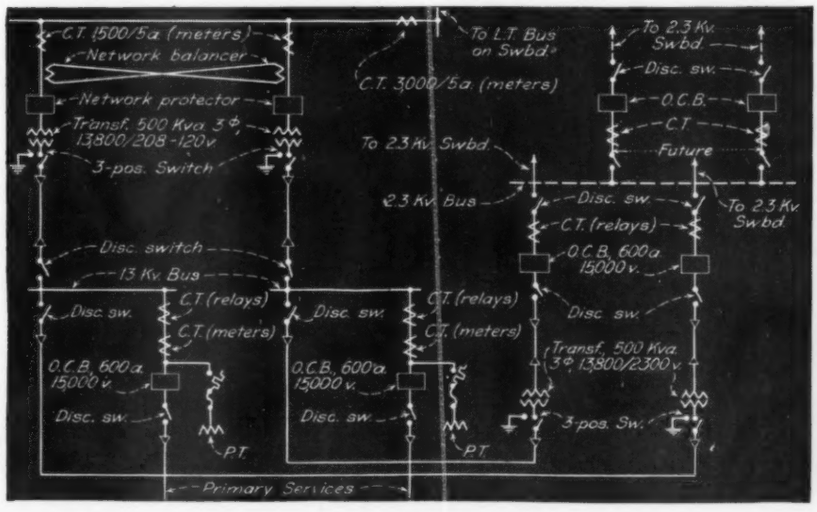
FOOLPROOF SWITCHING *of heavy feeders supplying 2300-volt motors is done with metal-clad cubicles, in the Interior Buildings. Note control scheme stencilled on board.*

208 volt transformer rooms located throughout these huge buildings. Low voltage switchboards are usually located near these outlying transformer stations for distributing the feeders that supply various lighting and power panelboards.

Here is an example of what a modern government building requires. The tentative electrical design for the projected Social Security Building—predicted to become the world's largest office structure—is said to include four 2000 kva, 13,800/2300-volt transformer stations to take care of the 2300-volt air conditioning system motors. About twenty-four 13,800/120-208-volt. 500 kva. transformer stations will supply lights and other motors. These transformers will be located in various wings of this huge structure.

To install the wiring for air conditioning some of Uncle Sam's existing buildings put electrical contractors and system design engineers to a real test. Perhaps the most difficult feat was in the old Capitol. Here thick old stone walls were pierced, and riser conduits were extended—somehow—with minimum structural defacement. To see the completed job arouses wonder. These jobs are all a tribute to the skill of electrical contractors and their workmen. They solved Uncle Sam's colossal weather problem.

SAFE POWER *transformation demands exacting construction. A typical group of 500 kva, 13,000/208 volt transformers in the Federal Reserve Board Building.*



NERVE CENTERS *like this ingenious gauge, recorder and control board in the Department of Interior Building (lower right) tell the operating staffs about the weather in all parts of the structure.*

POWER NETWORKS *are quite similar except for the amount of load. This schematic layout for the HOLC Building shows incoming 13.8-kv. primaries, the 2300-volt feeders, and low tension network scheme.*

NEW FACTS F
Feeder D

What Eight Years of Researc Bro
Carrying Capacity of Cod ns

TABLE I

CURRENT CARRYING CAPACITY OF RUBBER COVERED CODE GRADE WIRE

Based on Maximum Operating Temperature of 50° C., and Ambient Temperature of 30° C.

Conductor Size Awg. or Mem.	Current Carrying Capacity in Amperes						
	1937 Code Rating	In Free Air Isolated 1/C Cable	Installed in One Conduit				
			Single Conductor Cable			2/C Cable One	3/C Cable One
			One	Two	Three		
14	15	20	18	16	15	16	14
12	20	26	24	21	19	21	18
10	25	35	31	28	26	28	24
8	35	48	42	37	34	36	31
6	50	65	56	50	45	48	41
5	55	76	65	57	52	55	47
4	70	87	75	66	60	63	53
3	80	101	86	75	69	72	61
2	90	118	100	87	80	83	71
1	100	136	115	100	91	95	81
1/0	125	160	132	115	105	109	93
2/0	150	185	153	133	120	125	107
3/0	175	215	175	153	138	143	122
4/0	225	248	202	175	160	165	140
250	250	280	225	195	177	182	155
300	275	310	255	220	198	203	175
350	300	350	278	240	216	225	188
400	325	380	300	258	233	240	205
500	400	430	341	295	265	275	233
600	450	480	380	328	293	300	260
700	500	525	414	355	320	335	285
750	525	545	430	368	330	350	295
800	550	565	447	380	340		
900	600	605	478	400	360		
1000	650	650	505	420	377		
1250	735	740	575*	457*	409*		
1500	850	815	638*	486*	434*		
1750	935	890	695*	506*	451*		
2000	1050	960	750*	520*	463*		

* These values are approximate as they depend upon installation conditions. Due to the relatively low current rating of these cables, it is recommended that consideration be given to the use of multiple circuits or special conductor constructions to reduce a-c resistance, for example, annular conductors.

CORRECTION FACTORS FOR VARIOUS AMBIENT TEMPERATURES

Ambient Temp. °C	Correction Factor
10	1.41
20	1.23
30	1.00
40	0.71

is now available for the first time. It is the product of research work conducted by a technical committee of the Rubber Building Wire Group of the National Electrical Manufacturers Association. After eight years of tests, conducted under all conceivable conditions of operating temperature, loading, enclosure and grouping of conductors of various sizes, this committee has made a comprehensive report.

With this data electrical contractors can now plan feeder systems with greater assurance of adequacy than has been possible with existing Code tables. It is likely that some of the new tables will receive serious consideration for inclusion in future Code revisions. The complete report, comprising 15 printed pages, was recently released under the title "NEMA Report of Determination of Maximum Permissible Current Carrying Capacity of Code Insulated Wires and Cables for Building Purposes."

INSPECTORS, contractors and electrical engineers have been guided for many years by the National Electrical Code's tables of current carrying capacity for insulated conductors. Some have taken these tables literally. Others have adjusted them to factors of safety. The chief elements of uncertainty have been:

1. How much heat is generated by various combinations of conductors within conduits?
2. What effect does such heat have upon Code insulation?
3. What is the safe carrying capacity of conductors in different ambient temperatures and under various groupings within conduits?

Much accurate data on these points

RESEARCH CHAIRMAN—*S. J. Rosch, Anaconda Wire & Cable Company, who served as chairman of the NEMA Technical Sub-Committee responsible for these new facts.*

The Approach

The committee was formed early in 1931 to investigate existing Code ratings of rubber insulated wires and cables used in the wiring of buildings. It followed this procedure:

(1) Investigated historical data covering Code ratings for rubber insulated conductors.

(2) Determined factors affecting current carrying capacity under various installation conditions.

(3) Determined the maximum continuous safe operating temperature of Code grade rubber insulation.

(4) Determined the thermal surface resistivity of the customary outer coverings of building wires and cables, also similar factors for metal conduit.

(5) Set up formula for calculating allowable current carrying capacities of wires and cables under various conditions of installation.

UMI

TS FOR r Design

seard Brought to Light About the Cod Insulated Wire and Cable

(6) Developed tables for various sizes of Code insulated conductors, under conditions of installation in buildings permitted by the Code.

The Principal Factors

The fundamental factors affecting current-carrying capacity were found to embrace these variables—

a—Thermal surface resistivity of cable coverings and conduits.
b—Effect of number of conductors in conduit.
c—Nature of outer covering of cable, whether braided or lead covered.
d—The effect of color of outer coverings and conduits, whether black or white.
e—The effect of installation in air or in conduit, concealed or exposed, vertically or horizontally.

Ambient Temperature

There has been considerable confusion in the past concerning the term

HEAT AND INSULATION—*Showing conductor heat-rise leaway under two conditions of ambient temperature for three grades of conductor insulation.*

"ambient" temperature. The Code applies this term to the temperature of the air surrounding an installation in fully loaded condition. The difference between the maximum permissible operating temperature of a given grade of insulation and the ambient air temperature of a given installation, determines the maximum permissible temperature rise for that installation.

The investigation indicated that 30 deg. C (86 deg. F) is a fair average ambient temperature for indoor installations in general. Where the ambient temperature is other than 30 deg. C., a correction factor should be applied. Table 1 gives correction factors for different ambients and for the maximum operating temperature of Code grade insulation. Also these essential points were established by this investigation:

(1) The maximum permissible safe operating temperature for Code grade rubber insulation is 50 deg. C.
(2) The laws of thermal surface resistivity have been scientifically established for wires, cables and conduits.
(3) Data on the ac/dc resistance ratios for wires and cables in metallic conduit and in air, has been made available.
(4) Correction factors based on experimental data, have been established for installations in conduit.
(5) A standard ambient temperature of 30 deg. C (86 deg. F) has been established for the interior wiring of buildings and suitable correction factors provided for other ambients.
(6) A simple formula has been established for the calculation of current-carrying capacity of insulated conductors installed in air or in conduit.
(7) Tables of current-carrying capacity has been provided for a complete range of conductor sizes, where insulated with NEMA Code, NEMA Performance, and NEMA Heat-Resistant grades of rubber, to operate at a maximum permissible temperature of 50, 60 and 75 deg. C, respectively.

This interesting data, based on this extensive research, is the work of S. J. Rosch, E. D. Youmans and G. W. Zink.

TABLE 2

GUIDE FOR USE OF CURRENT CARRYING CAPACITY TABLES

The values given in Table 1 are based upon the installation conditions stated at the head of the respective columns. For a larger number of cables per conduit than that listed in the tables, the current carrying capacity can be obtained as follows:

Type of Conductor	No. of Cables per Conduit	Multiply Values for
Single Conductor Cables	4 to 6	3 cables by 0.80
Single Conductor Cables	7 to 9	3 cables by 0.70
Two Conductor Cables	2	1 cable by 0.85
Two Conductor Cables	3	1 cable by 0.80
Three Conductor Cables	2	1 cable by 0.85
Three Conductor Cables	3	1 cable by 0.80

Capacity Guide for Various Wiring Systems

In selecting the proper values of current carrying capacity for the various wiring methods in the National Electrical Code, the following guide should be used:

Wiring Method	Current Carrying Capacity
1. Open Wiring on Insulators	Use values "In Free Air Isolated 1/C Cable," but reduce the table ratings by 5 percent for each additional cable in the circuit or group of circuits.
2. Concealed Knot & Tube work	Same as in (1).
3. Rigid Metal Conduit	Use Values "Installed in one Conduit."
4. Electrical Metallic Tubing; Flexible Metal Conduit; Armored Cable; Non-Metallic Sheathed Cable; Service Entrance Cable.	Same as in (3).
5. Surface Wooden Raceways; Surface Metal Raceways; Cast in Place Raceways; Underfloor Raceways; Wireways; Busways.	Same as in (3) up to 9 Cables.
6. Non-Metallic Water-Proof Wiring	Same as in (3).
7. Non-Metallic Surface Extensions; Underplaster Extensions; Auxiliary Gutters.	Same as in (3) up to 9 Cables.

UMI

SMART PLANNING

TENANT COMFORT *dictated a complete electrical layout for this enlarged building.*

THE public square of Hagerstown recently witnessed a face lifting. A seven-story front was added to a six-story structure and the Professional Arts Building now provides modernized quarters for doctors and dentists. The job was done for about $100,000, which included a generous allowance to make the electrical conveniences complete.

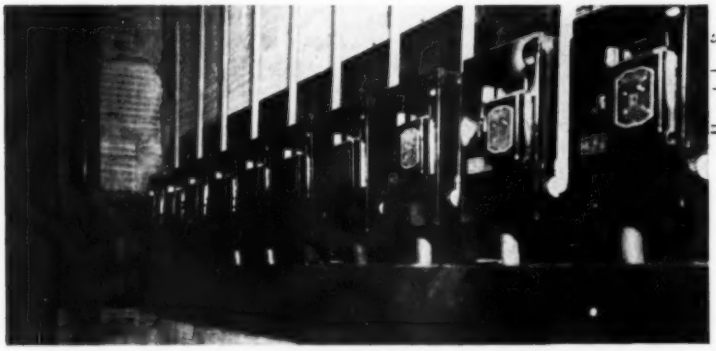
As equipped by The Lamp Shoppe, future tenants can enjoy air conditioning over some 28,000 sq. ft. of rentable area. Also, there are 51 radio outlets operating from two master antennas, entrance chimes in the reception rooms that operate from door switches, telephone raceways to two or more sections of baseboard raceway in each room and five double plug outlets per room. Each suite has one or more individual panelboards. The wiring layout provides separate branch circuits for every outlet at sterilizers, X-rays, dental chairs and other special appliances. However, to minimize disturbances to radio reception, all radio power outlets are connected on the opposite leg of the three wire lighting system from that to which X-Rays, sterilizers, and special transformers are supplied.

Since the air conditioning installation was handled by the electrical contractor, who is district agent for a leading manufacturer, the building incorporates novel treatment of its duct arrangement. Stale air is removed from offices through louvres in the doors, while conditioned air enters at circular ceiling duct openings that were combined with indirect lighting units.

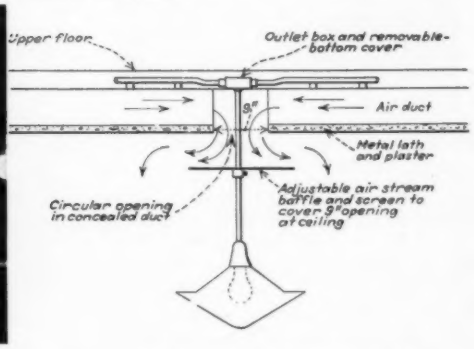
To make all these provisions involved some installation difficulties by using electrical metallic tubing to route the smaller raceways. With fabricated steel joist construction employed on most of the floors, the coupling of this tubing was easily accomplished, regardless of obstructions among the maze of steel struts.

CROWDED CEILINGS *were filled with concealed piping. Electrical metallic tubing simplified assembling the runs.*

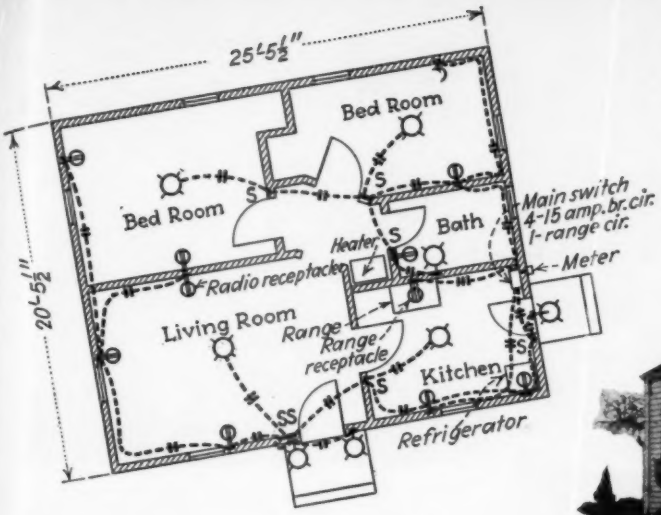
GETTING HOME *to larger panels meant careful routing through the struts of fabricated steel joints*



TROUBLE ISOLATED *by separately metered feeders to one or more panels located in various doctor and dentist's suites.*


Upper floor
Outlet box and removable bottom cover
Air duct
Metal lath and plaster
Circular opening in concealed duct
Adjustable air stream baffle and screen to cover 9" opening at ceiling

HIDDEN AIR DUCTS *have openings at ceiling fixtures in smart offices.*



WIRING DIAGRAM *of the Stran-Steel composite panel home laid out for 2-wire cable in all runs except the range circuit.*

STEEL FRAME *and prefabricated panels. This small house can be put up and finished within ten days.*

Wiring the Prefabricated House

How this new trend in house building will effect the electrical contractor

PREFABRICATED homes are on the way. Buy the lot, order the home and move in within two weeks. That's the program and with the growing housing shortage and high building costs, prefabricated houses will be a big factor in the already overdue residential building boom.

How will this affect the electrical contractor? Prefabricated or not, houses will still need wiring and fixtures and electricians to install them. This is how one organization will handle the wiring.

In Ecorse, Mich. an industrial suburb of Detroit, 125 composite panel homes are being erected as the opening gun of the campaign of one manufacturer. Stran-Steel frames, a patented steel framework for house construction, are paneled with insulating material and plywood in standard forms by a local lumber yard and delivered to the building contractor. The walls are erected and the ceiling panels installed. The chosen exterior finish is applied, wood siding, asbestos siding or brick, and the job is ready for the painters.

The electrician will arrive as soon as the interior panels are mounted. A large carton of materials will be waiting for him at the job. Outlets in the exterior walls will be roughed in from the outside before the siding is applied, the ceiling outlets will follow after the ceiling panels are erected. The roughing will be completed in four hours.

When the painting and interior are completed the electrician will return to finish. He will install the service riser and outdoor meter, switches and receptacles, fixtures, plug in the range and refrigerator, and in another four hours the job will be completed.

Based on the estimates of a number of contractors, 8 labor hours has been established as the average labor cost for the electric work in one of these standard homes. All of the necessary wiring materials for a single job will be packaged in one carton. Another package will contain the fixtures. Sold through a building supply firm, these packages will be available to the builder at about $26.00 for the wiring materials and 18.00 for the fixtures. The same supply organization will furnish the range, water heater, refrigerator and oil burner.

The accompanying diagram shows the wiring plan. Three plug receptacles in the living room and two in each bedroom are provided. Switches control all lighting fixtures. The distribution cabinet provides two lighting and receptacle circuits, an appliance circuit, a range circuit and one spare. The service is three wire, 50 ampere.

The list of wiring materials and the labor costs are based upon CNX, or protected neutral cable which is permitted in the Detroit area for trial installation. A somewhat higher cost is anticipated in those areas where CNX is not permitted.

While the prefabricated home program indicates less volume for the electrical contractor, a huge building revival would keep a lot of men busy.

MATERIALS FURNISHED TO THE ELECTRICIAN AT THE JOB

25	feet 2-6, 1-8 service cable
2	service cable connectors
12	service cable straps
1	weatherproof connector
1	distribution cabinet-main, range, 4 branch circuits
1	ground clamp
10	feet #6 bare ground wire
15	feet 3-conductor cable
1	range circuit connector
1	range receptacle
1	combination 2-SP switch and plate
1	combination 1-SP switch—1 plug receptacle and plate
4	S.P. switches and plates
9	duplex plug receptacles and plates
15	clamp type switch boxes
8	clamp type 4" octagon boxes with studs
7	plaster rings
4	connectors
300	feet 2-conductor cable
8	fixtures

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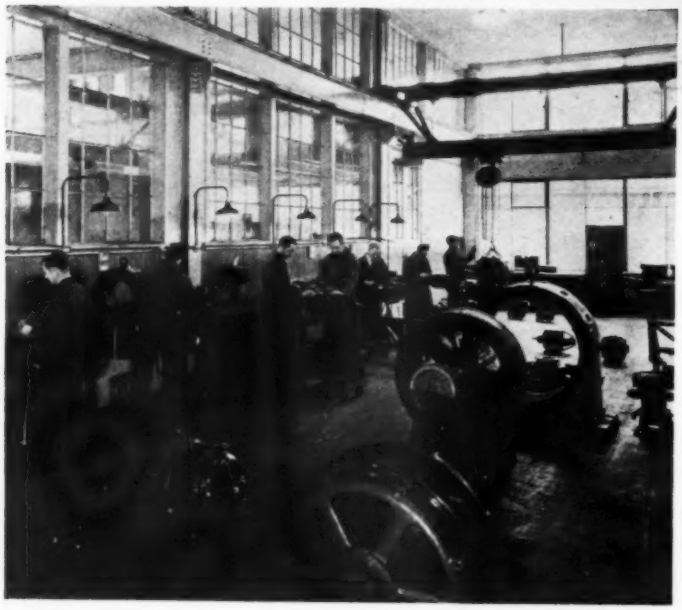
EMPLOYEE GROUP—*Wearing lettered uniforms, these men work efficiently in orderly well-lighted surroundings.* (*below*)

OFFICE STAFF—*Eight persons handle the business end for this diversified organization.*



Servicing

This successful industrial motor shop organization operates in the San Francisco area

TAKING a cue from the modern plants it serves, the Buzzell Electric Works of San Francisco maintains a motor shop equipped for industrial specialization. The same elements of efficiency in motion economy, efficient work flow, quick production facilities and modern handling of supplies, have been incorporated. And to make pace with a fast industrial world, this company's adequately equipped shop keeps a fleet of five service cars rolling over its trade area.

The attractive Buzzell Building at Eighth and Minna Streets is planned to take care of a diversified run of work. There are complete facilities for repairing large and small apparatus, for the efficient control of electrical construction jobs, for the attractive

THEY GET AROUND—*Buzzell serves Pacific Coast industries from these attractive headquarters with these trucks and cars*

DISPLAY HANDLING—*Easy placing or removal of apparatus with overhead traveling hoist facilities permits arrangement of items without injury to floors or to finish of equipment.*

BURDENS LIGHTENED—*Effortless handling of apparatus speeds the work from the receiving dock to all shop areas.*

West Coast Industries

display of apparatus, and of course, for running the office routine of all departments of this successful business.

The plant layout includes an unusually complete crane and monorail installation. Arranged in four systems or sections, the handling of heavy parts from the shipping door to any part of the shop or sales floor is done from chain blocks. Equipment is moved quickly with little hazard to workers or to itself.

The system begins with a monorail at the alley entrance, feeds to the traveling cranes and monorails in the electrical and machine shops, to the cleaning, spraying and baking areas, and the display areas. Traveling chain hoists are standardized to fit all monorails and I-beams of the system, and can therefore be transferred or routed to any area without releasing their burden.

Labor-saving tools for each department have lightened the task for workers, which spells better results on the tough jobs that come to a plant of this size. Being advocates of modern industrial lighting, the Buzzell workers enjoy the benefits of special high-bay lighting in the main shop area, plus correct supplementary units at benches and at machines.

To handle all kinds of industrial work with complete control over the job, this company's machine shop is equipped and manned to avoid having to go to outside machinists. Two lathes, two drill presses, power hacksaw, grinder, buffer and other important tools are available, all indispensable to the modern machine shop.

Customers who call at Buzzell headquarters find an efficient office with eight persons at hand to transact business "up front." Back of the scenes are neatly arranged parts bins, stocks of construction materials and the various supplies that keep this industrial service organization profitably occupied. This plant is doing a fine business in keeping the wheels of San Francisco's industries turning.

HAZARDS REDUCED—*Safety and comfort in the cleaning, baking and spraying area has been assured by backsaving hoist, mono-rail, fume removal, and isolation of harmful dusts.*

How TO GET BUSINESS

By P. M. Geary
Youngstown Manager
Steel City Installation Company

Out of a unique experience in range wiring, Mr. Geary makes some frank comments on the reasons why so many contractors do not prosper. And he points the way. This is the second half of his recent paper before the NECA Convention.

TWELVE Youngstown contractors have had an interesting experience in range wiring. The story was told to the NECA Convention in Detroit. It was published here last month. In a word, these contractors have jointly set up a separate corporation to wire for electric ranges and water heaters and we are installing all the ranges for the power company.

We find that by specializing we can cut the price 20 percent under the old figure paid to free lance journeymen and still make a satisfactory profit. This is because mass production methods cost less. As a result of this experience, we believe that what can be done with ranges and water heaters, can also be done with any other kind of small wiring jobs, including small new houses. It is only necessary to find a way in each community to concentrate enough jobs of one kind in the hands of one contracting concern, so as to permit of specialization and standardization.

But in most communities throughout the country, the business of contracting for small wiring jobs of every nature has passed into the hands of journeyman contractors. They are willing to operate without profit and knowingly or unknowingly, to absorb their overhead in their wages, so they install these small jobs at prices to the public so much lower than those which must be charged by contractors, who employ labor and conduct a business, as we understand the term, that the contractor who is an employer has been completely eliminated from that field.

His employees whether they be union or non-union have been eliminated along with him.

If we are ever to secure this volume we must find some way of reducing our cost so as to at least approach the price at which the journeyman contractor can operate. And we will never do that as long as we try to use the same methods on small jobs as we do on large ones. The answer undoubtedly lies in selling. But selling is the thing we don't seem to like to do. The electrical contracting industry has too many managers, too many engineers, too many superintendents, too many mechanics and *too few salesmen.*

Our Future in Selling

We have become so accustomed to having our selling done by some other branch of the electrical industry or by some other industry that we think they should keep right on doing it. We not only don't want to do any selling ourselves but we don't like to employ salesmen either. If 50 per cent of the contractors could be induced to take jobs as salesmen for the other 50 per cent, a large volume of business would be created and all concerned would make money, including most of the contractors who became salesmen.

While we have to give the other branches of the electrical industry credit for doing some of our selling we also have to give them credit for increasing our costs. And the strange thing about that is, that the interests that make the loudest demands for lower wiring costs are the same ones who have done the most to increase costs.

The National Electrical Code recognizes and approves 17 different types of wiring. Each type requires its own peculiar kind of materials and fittings. In addition to this, each manufacturer of any of these types of material, with few exceptions, has his own peculiar designs, which further tend to prevent standardization. The electrical construction industry has no more economic justification for 17 different types of wiring than I would have for 17 wheels on my car. And I have trouble keeping tires on four of them.

It seems that every time a manufacturer thinks he isn't getting his share of the business he developes a new type of material, gives it some kind of a ridiculous sounding trade name and then cries in a loud voice that its use will reduce the cost of wiring. Then by some magical process he gets it recognized in the Code. The next move is to continue the magic and the noise about reducing wiring costs, until he gets some of the major utilities to recommend its use to contractors. After that we have another type of wiring material, but its cost installed on the job is always about the same as that of some other type which we already had.

Another way in which the other branches of the electrical industry have helped to increase our costs is by encouraging more and more persons to

(Continued on Page 55)

UT IN FRONT Again

with the NEW

UTLER-HAMMER 4140

ype D "PULLER" SWITCH

Entirely new principle of front operation

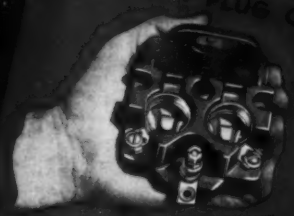
The pictures tell the story of this latest development of Cutler-Hammer . . . the new 4140 Type D PULLER Switch. Modern and attractive in appearance, of amazingly small size, it has advanced design and sound construction . . . BIG-SIZE sturdiness, BIG-SIZE dependability, BIG-SIZE convenience of operation, BIG-SIZE ease and speed of wiring.

But only when you stock the new 4140 Puller Switch will you discover its BIG-SIZE business creating possibilities.

Every home has need of one or more . . . every factory, shop, store offers rich opportunity. It meets the need and sets the pace in a live market.

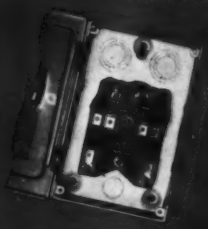
Priced same as the old 4140, this is a lot more switch for the money. Check its 10 features, then tie in with the New 4140 for all it's worth. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturers, 1306 St. Paul Ave., Milwaukee, Wisconsin.

CUTLER-HAMMER
SAFETY SWITCHES
C-H



With No More Works Than This

And All These Knockouts



And All This Wiring Space

YET IT HAS THESE PACE-SETTING FEATURES

Remember! It's 4140, the LITTLE *Switch with the* BIG *Advantage*

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The Newest Development in Time Switches!

Paragon announces its new 300 series comprising

SEVEN MODELS
of

Low Priced, Self Starting Synchronous Time Switches
Single Pole—Double Pole—Double Throw
30 Amperes—3000 Watts—per pole

Absolutely Accurate and Dependable in Operation
Exceptionally Simple and Sturdy in Construction
Very Modern and Compact in Design
Most Inexpensive and Easy to Install.

Unquestionably *the* outstanding line of low priced time controls—backed by the Paragon Guarantee of highest quality and by forty years of time switch manufacturing experience.

Write us or ask your jobber for your copy of Descriptive Bulletin 3857.

Presenting PARAGON 300 SERIES TIME SWITCHES *at a New Low Price* $14.00

STANDARD PARAGON DISCOUNTS TO THE TRADE

PARAGON ELECTRIC COMPANY
37 W. Van Buren St., CHICAGO
Factory, Manitowoc, Wis.

DISTRIBUTED BY WESTINGHOUSE ELECTRIC SUPPLY CO. AND ALL OTHER LEADING ELECTRICAL JOBBERS

GALLOWAY

Where FACTORIES NEED LIGHT

A check-up of the industries of a typical city, shows a large and profitable market for lighting ready waiting for the Contractor

TO see how much industrial lighting business is actually waiting to be done in the average city, two men recently made a careful check-up. One was an ex-contractor—one a lamp man. They went to a typical manufacturing town of 125,000 population, located on the Eastern seaboard. There are some 365 factory establishments in the town. These industries employ 16,000 workers who draw an annual wage of $16,000,000.

This community represents the same kind of a lighting market found in the average industrial city—in your town, for instance. "Survey Town" factories make a diversity of products. Some 80 concerns are processors of food stuffs. General service organizations number 55. In the strictly manufacturing or fabricating class are 230 companies. Among them are firms that make wood, paper and textile products. Others are engaged in rough production or in light manufacturing.

These industries, averaging fifty workers per plant, are located in six factory zones that roughly mark the industrial areas of "Survey Town" and, just as in your city, they range from large to small. Some are in new buildings, some in old. Some occupy a few floors of some old plant. Many lack natural daylight. Quite a few operate night shifts. Some present distinct explosion or fire hazards. Many are in great need of better lighting equipment.

So there is a big opportunity in "Survey Town" for any electrical contractor who wants to make money in the lighting business. For there are two reasons why these manufacturers are ready to buy better illumination—

AN INDEX TO INDUSTRIAL SELLING

A group classification of the 365 factories in "Survey Town."

THE SANITARY GROUP—80 UNITS
Bakeries, candy, dairies, ice cream, meats, provisions, bottling, tobacco, laundries, cleaning plants.

GENERAL SERVICE GROUP—55 UNITS
Auto fenders, radiator repairs, upholstering, awnings, mattresses, machine and welding shops, printing trades.

LIGHT FACTORY WORK—54 UNITS
Sheet metal spinning, stamping, fabrication, leather products.

HAZARDOUS PROCESSES—10 UNITS
Brewing and distilling, chemicals, enameling and lacquering, varnish and paint, volatile fuel handling.

WOOD AND PAPER FABRICATION—38 UNITS
Boxes, crates, containers, furniture, toys, wall board, insulating materials, linoleum and rubber flooring, mill work.

CLOTH AND GENERAL TEXTILES—35 UNITS
Carpets and rugs, clothing, caps, hats, dresses, work garments, cloth yarns, spinning and weaving.

ROUGH PRODUCTION WORK—93 UNITS
Brick, concrete, stone and rough tile products; floor tile, earthenware; foundries, structural steel fabrication, wire rolling and drawing, molded products, heavy machinery.

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MAN-POWER FACTORS

A study of who employs the workers in 285 larger plants in Survey Town.

Food Products —		Employees
Bakeries & Candy Factories	7 plants	20 to 189
Beverages — Distilleries	9 plants	4 to 40
Ice Cream — Dairy Products	8 plants	5 to 201
Ice Plants	4 plants	4 to 28
Meats — Provisions	15 plants	5 to 40
Consumer Services —		
Automobile, Fender and Body Repairs	19 plants	5 to 55
Furniture, Mattresses, Upholstery, Awning Factories	11 plants	5 to 830
Garments, Hats, Caps	25 plants	10 to 400
Laundries, Cleaning, Linen Supply	24 plants	5 to 263
Printing, Engraving, Publishing	19 plants	5 to 251
General Manufacturing —		
Boxes and Containers	7 plants	6 to 58
Building Products, Paint & Varnish, Mill Work	17 plants	6 to 158
Foundries, Structural Steel and Other Metal Trades	30 plants	6 to 849
Textile Products	5 plants	12 to 469
Miscellaneous Heavy Industries	49 plants	28 to 5164
Miscellaneous Light Industries	36 plants	4 to 66

troubles. And the first step is to make the men and women comfortable at their machines and benches. And the first and easiest step is to give them good light.

This is now the most pressing problem of management in America. The need for improving industrial relations is changing the attitude of manufacturers towards what we so long have called "modernization." It is making a new market for better lighting, more complete control of motors and machines, ventilation, air conditioning, signalling and other electrical equipment that the contractor has to sell. But the first step in almost every case is to interpret the pressing needs for better lighting.

This check-up in "Survey Town", therefore, reveals the kind of opportunity that waits in every community where there is any manufacturing. There is the same varied market, the same diversity of lighting problems that need your help. The data developed in this survey, presented in the following pages, might just as well have been gathered within a radius of two miles around most any contractor's shop. Out of it came some simple conclusions that offer guidance to the contractor in selling industrial lighting in any city.

1. The factories in any city divide themselves into natural groups with somewhat common lighting problems.
2. These groups have these similar lighting problems, because they are concerned with similar processes or operations where the same applications of light are needed.
3. There are enough prospects in these several groups to make it worthwhile for any contractor to study their lighting needs and specialize in them.
4. Experience in improving the lighting of any group of factories soon develops an experience that will make this specialization easy.
5. Success in helping these different kinds of manufacturers with their lighting problems soon builds up a local reputation among the plant men and makes the selling easy.

HORSE-POWER FACTORS

How Survey Town's Typical Industries Use Power for Production.

Class of Manufacturer	Connected HP	KW Demand
Bakery	253	74
Brass Fittings	246	87
Candy	618	122
Cigars	271	102
Cloth-Rubberized	485	217
Dairy	659	200
Electrical Products	191	54
Enamelling—Porcelain	89	50
Floor Covering	6608	1452
Garments	338	106
Hardware	193	58
Ice	611	154
Insulation Board	1692	588
Leather Products	115	48
Meat Products	138	42
Milk Depot	123	37
Pottery	275	64
Printing Ink	59	20
Rubber Products	1268	445
Textiles	179	32
Tobacco Products	232	76
Wire Rope	3771	1320

The first step is to know the market. And this is also simple. Make a list of the factories within easy reach. Group them in the several classes that have common lighting problems. Rate them for size by number of workers or horse power connected. The data for setting up the various phases of this information is not hard to obtain in any community. After it has been set up in your own way, the next step is to decide which group offers the best place to start. Then start.

KNOW YOUR FACTORIES *from large to small. Also know the keymen who need light to help them do a better job throughout their plants for different processes.*

APPLIED LIGHTING *draws upon a wide diversity of methods and principles. The chart, (right), shows some typical needs in one small plant area.* ▶

What Industry does with LIGHT

While plant needs vary somewhat, certain lighting objectives are found in every factory—which makes it easy

WORKER TASKS *vary widely, but the common problem is to see the work. Note how important good lighting is rated at these polishing stands.*

INTERVIEWS with factory men in "Survey Town" produced a variety of answers to the question—"How do you use light?" In every case, considerable thought had been given to lighting. The factory men themselves were ready to point out ways in which lighting.

It is the lighting man's job, of course, to amplify, in the customer's mind, those benefits of which he is not aware. These are basic points to use—

1. TO PERMIT NIGHT-TIME OPERATION—Some industries regard artificial lighting simply as a means of permitting night time operation when necessary. Most early factory installations were sold entirely on this basis. Moreover, all industries appreciate the need for some lighting of this kind to meet occasional emergencies, although no regular night time operations are carried on. Here then, is the opportunity to point out the small difference in cost between mere make-shift lighting and a well-designed system.

2. TO SUPPLEMENT DAYLIGHT—Other industries consider two functions of artificial lighting—for night operations and to supplement daylight on dark days. Many locations can be found in factories where the supply of daylight should be supplemented at all times. But any artificial system of illumination should be designed to be entirely adequate and independent of daylight conditions. Here again is an opportunity to point out the advantages of a really adequate system of lighting.

3. TO INCREASE PRODUCTION—Industry is constantly faced with the struggle to keep production at a maximum. Tests show that a definite relationship exists between speed of production and the level of illumination in all industrial tasks in which seeing is a factor. In many cases, the increase in production alone is sufficient to more than pay for the lighting.

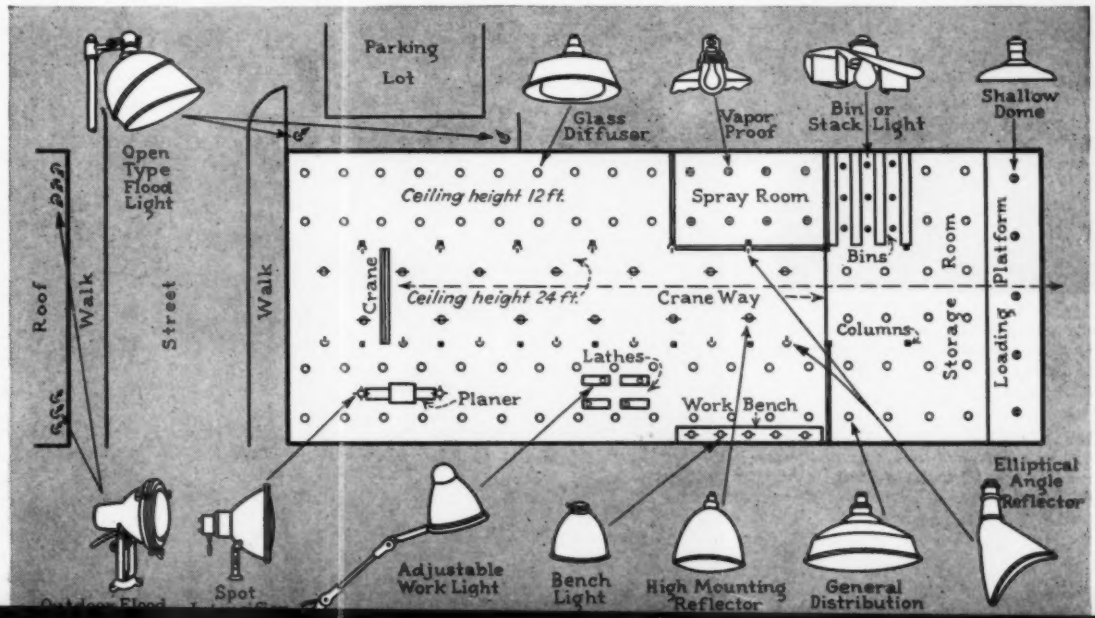
4. TO REDUCE ACCIDENTS—Accident reduction is a very real problem to industry. Great sums of money are spent each year for automatic devices to protect careless workers. Much time is devoted to safety education of employees. But above all else, quick accurate vision is essential to the avoidance of accidents. Good seeing requires good lighting. Light, as a tool for accident prevention, is unique in that it serves as an aid rather than a hindrance to the regular operations. All industrial executives should be made familiar with the fact that light is a basic safety device.

5. TO REDUCE SPOILAGE—Lighting plays an important part in spoilage reduction. Workers handicapped by inadequate illumination cannot produce goods of perfect quality. Spoilage represents a waste of both time and material. It is also a serious factor in slowing down production. Industry is therefore vitally interested in improving the quality of product. Good lighting can do this.

6. TO REDUCE ERRORS—Errors often prove very costly, and every industry is anxious to avoid them. Good lighting is a means of cutting down mistakes in filling orders, recording figures, reading blueprints or in other tasks where seeing must not be faulty. Provisions for accurate seeing, reduced eye strain and fatigue relief keep workers in fit mental condition. This all helps to hold mistakes at a minimum.

7. TO MAKE SUPERVISION EASIER—Factory workers declare themselves less subject to fatigue under good illumination. Therefore, the well-lighted plant attracts better help. With a better morale among the workers supervision is made easier and less expensive.

8. TO IMPROVE CLEANLINESS AND ORDER—Maintaining cleaniness and order is always a difficult problem in a factory. In a poorly lighted plant the task becomes doubly difficult, if not impossible. But in food industries, such as bakeries, dairies, meat packing houses, cleanliness is of paramount importance. It has a direct bearing on the quality of the product. In the dairy industry, for example, a single bottle of milk delivered in an unclean condition may cause serious damage to the reputation of the firm. This provides the sales opportunity for the electrical contractor.



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DOUBLE HAZARDS *to worker safety and machines prevail in glare and gloom where printers work like this.*

Sore Spots in FACTORY LIGHTING

Since management's chief problem today is to provide better conditions for workers, the lack of good lighting is the place to begin—so find the places where lighting is bad.

WITH industrial accidents estimated to cost $1,500,000,000 a year, coupled with an annual toll of 19,000 fatal accidents, enlightened factory officials are ready to discuss inadequate lighting. But too often they do not recognize the familiar twilight zones in their own plants as lighting hazards.

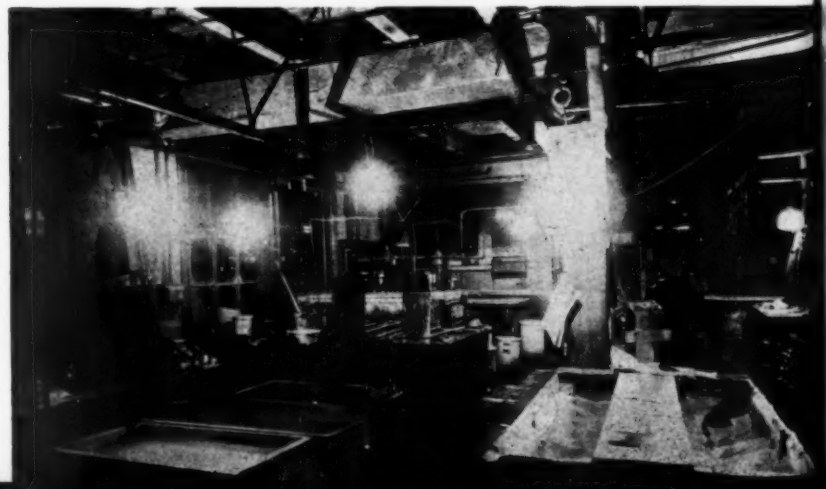
Proof that good lighting pays, comes willingly from many industries, that are ever searching to provide new facilities with which to replace what was heretofore considered good practice. Plenty of cases are also available to show that bad lighting is expensive. But each man must see the cost of bad lighting *in his own plant,* before he will do anything about it.

In "Survey Town" these bad spots were of all kinds. They varied with the kind of work performed. So it is in your town. Here are some outstanding examples of bad lighting to be observed during the survey—they are to be found in factories everywhere. Look for these sore spots. Size up their effect upon employee morale, upon production, upon waste, upon operating costs. These are your strongest selling arguments—

1. *Dark Spots*—Workers forced to grope in semi-darkness among machinery, near stairs, or in passageways—all places where danger lurks.
2. *Glare Annoyance*—Bare lamps or improper reflector shapes or sizes that put glare in the worker's line of vision.
3. *Sharp Shadows*—Critical work tasks masked or distorted by the handicap of pronounced shadows cast upon the working plane.
4. *Insufficient Local Light*—Close work handicapped by lack of intensity, or by workers shadows cast on the work from general lighting.
5. *Improper Contrast*—Intense local light at close work not balanced with sufficient general illumination, resulting in severe reactions upon the vision.
6. *Incorrect Light Distribution*—Outlets not properly spaced to provide even general illumination. Local lighting not sufficiently adjustable to meet varying work positions.
7. *Unsuitable Applications*—Specific operations not lighted with equipment most adaptable to the actual need—as to intensity, brightness, angle of projection, coverage of entire work area, freedom from reflections or glare.
8. *Color Discrimination*—Color of light source fails to accentuate or give true colors of product or materials as in grading, inspection, processing.
9. *Unusual Atmospheres*—Inadequate provisions for penetrating dense smoke, dusts or vapor prevalent and unavoidable in general working areas.
10. *Subnormal Efficiency*—Lamps burned at improper voltage—equipment not suitable for overcoming unfavorable conditions such as dirty atmospheres, unusually dark walls and ceilings, or cluttered pipes and shafting.

PRODUCT WASTE *in this battery making plant takes profits and promotes worker trouble among such twilight zones.*

SLOW PRODUCTION *and errors result from haphazard seeing facilities at these solvent vats. How would you like to work there?*



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REG. U. S. PAT. OFF.

Hygrade

FOUR SENSATIONAL NEW LAMPS BY HYGRADE

Here are four new Hygrade Lamps that mean real profits for you. Each one belongs to a special market . . . each does its job better than any previous lamp in its field. Each means new, more satisfied customers for you.

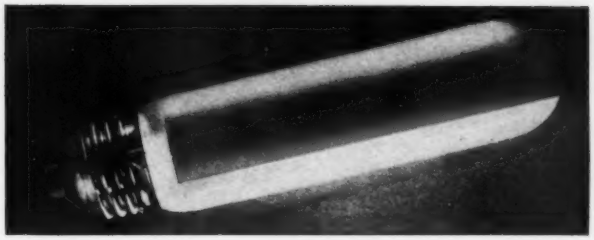
1 NEW HYGRADE FLUORESCENT LAMP

A "natural" for stores, merchandise displays, theatres, restaurants, offices, factories, etc.

Entirely new...without a filament...giving several times more light for the wattage consumed than filament lamps of same wattage and color.

The daylight fluorescent lamp gives the closest approach to actual daylight yet produced...also comes in red, pink, gold, green, blue and white.

50% cooler than ordinary lamps giving same amount of light...ideal for displaying textiles and colored goods.



2 NEW HYGRADE PROJECTOR LAMP—PAR 38

Small, compact, and effective...containing mirror-reflector, directing lens and 150 watt filament hermetically sealed in a single unit.

Will not deteriorate from moisture, weather, etc....excellent for outdoor use.

Two types...SPOTLIGHT for store windows, theatres, cabarets, etc. ...ideal for industrial spotlighting...FLOODLIGHT for store windows and interiors, factories, outdoor lighting, signs, billboards, service stations, used-car lots, etc.

3 NEW HYGRADE 25 WATT T-10 SHOWCASE PROJECTOR LAMP

Gives three times the illumination of ordinary lamp on the merchandise under average showcase conditions with no increase in current consumption.

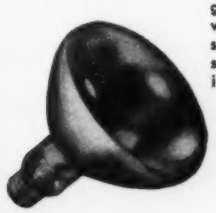
Self-contained inside aluminum reflector and special inside pale frost.

Dust free and efficient.

Makes modern showcase lighting more efficient and economical than ever before.

4 NEW HYGRADE R-40 REFLECTOR LAMP

Produces a narrow beam and is particularly suitable for indoor use where high levels of illumination over small areas are required. Employs same kind of mirrored surface as the new Projector lamp, but since it is made of ordinary glass must be protected from the weather...particularly suitable for spotlighting store windows and store interiors, theatres, and for industrial spotlighting.



Hygrade

TESTED QUALITY

Lamps

Licensed under General Electric Company's Incandescent Lamp Patents

Hygrade Sylvania Corp., Salem, Mass.

Without obligation please send me complete details on these 4 new Hygrade Lamps.

Name_____

Street_____

City_____ State_____

Where to Sell Extra LIGHTING

Thirteen conditions commonly found in factories that offer opportunities to demonstrate how light helps to increase production and profits.

INDUSTRY WAITS *for your answer at many light-hungry work centers. They need help, like the improvement made for this metal-work shop.*

IF there is any one basic rule in selling better light to industry, it is this. Don't talk to the factory man about light. Talk about his processes and operations—and what light he needs for them. Put the whole problem in terms of his interests—what he wants to do—not what you want to sell.

Obviously you will need to consider the two universal plant problems—good visibility all over the plant and complete relief of eyestrain at all local operations.

Inadequate general lighting conditions set the stage for accidents. When the worker looks away from a brightly lighted area in search of a tool, he must not be temporarily half blind. Good general illumination, therefore, builds the background for every installation.

But conventional general lighting is not the answer to all plant-wide seeing problems. Many factories have areas where bay lighting was satisfactory originally. Later other types or layouts of machinery have created new conditions that call for a changed arrangement of lighting units. These inadequacies may be—

1. Lack of uniform levels of illumination throughout the entire room because of improperly spaced units.
2. More light in aisles or at back of machines than in areas where visual work must actually be done.
3. Shadows on parts of the machines or on the workers in the important seeing areas.
4. Glare produced in the eyes of those operating nearby machines.

There are other situations where high levels of localized lighting may be required, as where one attendant may

TOUGH PROBLEMS *require bold treatment to give complete results, as with this evenly lighted radio assembly room.*

SMALL AREAS, *like this cleaner's shop, pay heavily for poor lighting. Here it is in returned garments and lost production time.*

SPECIAL PRODUCTION *with irregular work spaces and working levels is hard to handle. Only good lighting can assure good work.*

UMI

THE UNSEEN HAND

Sterling Reflector P

This new, popular priced Sangamo KZ Astronomic Dial Time-Switch requires no resetting the year 'round.

THAT MAKES THIS TYPE OF INSTALLATION COMPLETELY AUTOMATIC

That brightly illuminated store windows attract passers-by in the evening (and customers the following day) is beyond dispute. Just why it is that only a comparatively few merchants light up their windows is a puzzle to which the logical answer can only be: no one has sold them a modern time-switch.

Here is a selling job for aggressively minded contractors! Talk in the prospect's language—explain how the Unseen Hand will help attract new business. With the many conveniences and features you can offer in Sangamo Switches, often a single call will result in a Sangamo Time-Switch sale.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

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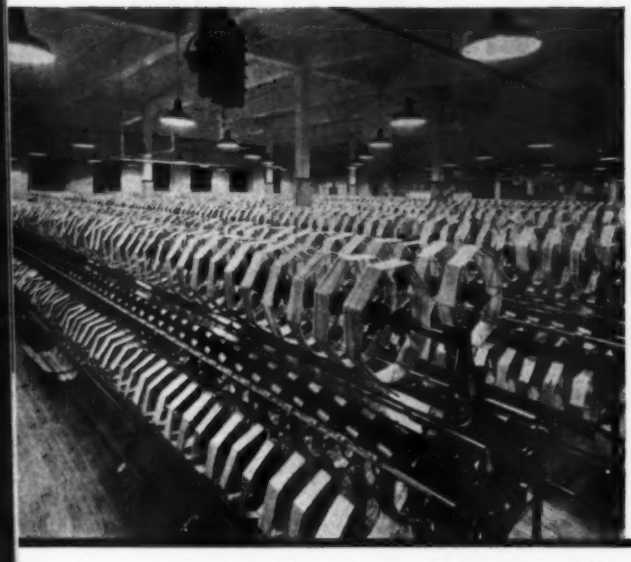
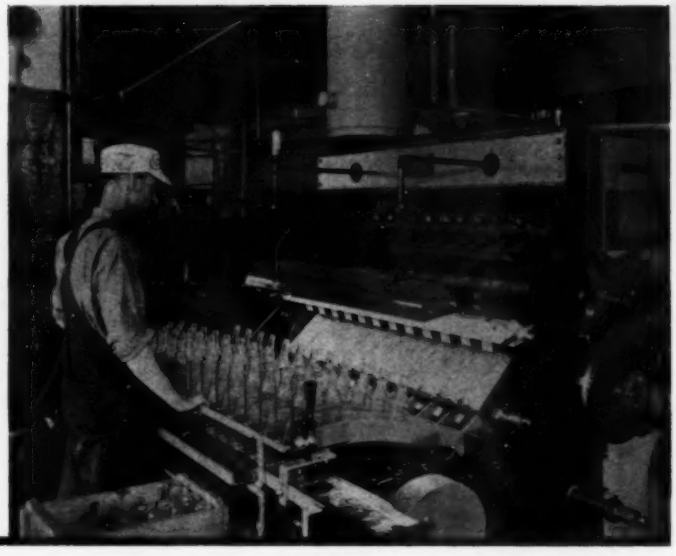


RAPID MOTION *of fine objects, as in this hosiery mill, call for maximum shadow and glare elimination to help the workers.*



CRITICAL SEEING, *at this inspector's station threatens that dirty bottles will go through. Light saves customer good will.*

take care of a number of machines. Looms and spinners in textile mills, automatic printing presses, and a wide variety of automatic machines in manufacturing plants are examples.

In every case, it is the problem of the factory that makes the problem for the lighting man. Therefore, the study of a factory should be a search for those kinds of working conditions, processes, operations that involve the need for light. Every factory has a great variety of localized seeing problems—visual burdens that need relief from eyestrain, glare, reflections, shadows. Only a search will disclose them. They vary too widely to be separately pointed out in a limited space. But they may be logically classified under these 13 heads—

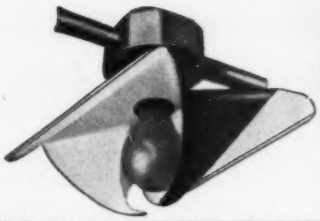
SPEEDY HANDS *and quick seeing can be coordinated when the visual problem it studied from the worker's viewpoint.*

1. *Where machines are hazardous*—In planing mills, wire and rope mills, box factories, wood working plants, where forging and welding is done, and in dozens of other industrial situations, the machine is a real menace to the worker. There are racks or knives or punches that can catch a finger or a hand—despite safety precautions—unless the operator is both expert and alert. These are anxious spots for management. But in many cases the hazard can be largely eliminated by better lighting—lighting that will so illuminate the danger that the worker is automatically more cautious, more alert, more safe. The foreman is ready to recommend extra lighting for these places and management will authorize it. It will avoid accidents, reduce spoilage and save money.

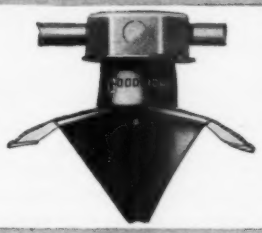
2. *Where accuracy depends on speed*—In textile mills, canning factories, packing houses, newspaper plants, many metal working industries and in certain departments throughout all kinds of manufacturing are high speed operations. Many of them are almost automatic. But in a cotton or rayon mill men and women watch the flying shuttles, the spinning bobbins, the racing threads and must notice instantly when things go wrong or loss results. Intense shadowless illumination here saves time, materials and profit, but it also adds to the skill of the operator, her ability to speed production. So where high speed operations are found, there is a need for extra light.

3. *Where big machines cast shadows*—In auto body plants, sheet metal shops, rubber factories, steel mills, they use big machinery that stands high and wide and interferes with the general illumination. You find it too in rock crushing, coal tipples and where clay products are made. These shadows should be killed with local auxiliary light sources, mounted so that the worker always has a clear easy view of the tool and the controls. Whenever a large machine of this kind is at work, there is a job for extra lighting.

4. *Where shiny surfaces reflect the light*—Printers often suffer from poor lighting because the faces of the type throw back the light into their eyes. In enamel works, plate glass plants, furniture finishing, photo engraving, plating processes and similar cases the same trouble is met. The product itself produces glare and the only thing to cure it is extra light properly positioned. Auxiliary light sources will kill these reflections, save eyestrain, speed up production and improve quality. So it pays to watch out for this condition.



The odd shape does the trick—note how it sheds light to the sides, intensifies illumination from top to bottom on shelves and bins . . . prevents waste of light on the ceiling.



Aisle glare is eliminated by curved V-shaped flanges. The Stocklite is finished in porcelain enamel; inside reflecting surface is pure white; exterior, a pleasing neutral gray.

SELL THE STOCKLITE

For Proper Illumination of Shelves and Bins in Narrow Aisles

● Wherever you sell the Stocklite you can be sure you've made a friend. Users everywhere are enthusiastic. And rightly so, because this unique fixture enables stock clerks to read labels, small parts numbers or typewritten slips anywhere in stockroom aisles. It soon pays for itself in the quicker and more accurate handling of orders. And that's important to all of your customers!

The Stocklite is designed especially for this purpose. It uses the lamp's full efficiency—increases the intensity of light on shelves and into the interior of bins—eliminates harsh glare in the aisles—assures more comfortable vision. It's finished in porcelain enamel, a weatherproof, permanent fixture. Easy to install. An exclusive Goodrich product.

Here's a fixture that sells on demonstration. You can prove it—and use it as a real business developer.

WRITE FOR THIS NEW BULLETIN

It gives you all the facts about the Stocklite. It's fully illustrated with interesting installation photos; complete with engineering data, light distribution curves, instructions for mounting, spacing and installation. Write for your copy today. Ask for Bulletin 91, "Light on the Subject."

Sunny-Lumens
THE GOODRICH REFLEXPERT

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES & FACTORY: 2902 NORTH OAKLEY AVENUE, CHICAGO, ILLINOIS

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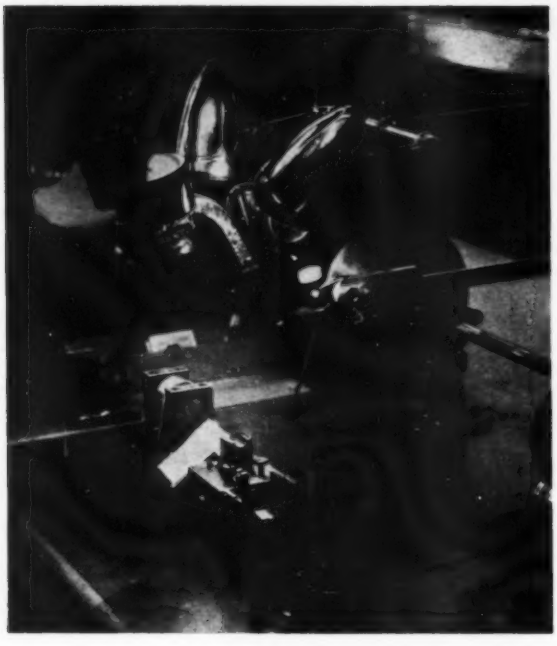


PRECISION WORK *has provided the incentive here for developing local sight-relief. It insures greater accuracy.*

5. *Where grading, sorting or inspection is difficult*—The speed with which materials may be inspected or graded depends entirely upon how long it takes the man or woman at the bench to reach a decision. It is true of shoes, hats, hosiery, ceramics, cigars, food products, chemicals and often with metal products. Also, the accuracy of the grading is involved and therefore, the quality of the product. Extra light here solves the problem often by mere intensity and sometimes by the direction from which it comes or by better color values, as in a pottery. This operation is often a good place to demonstrate what better light will do.

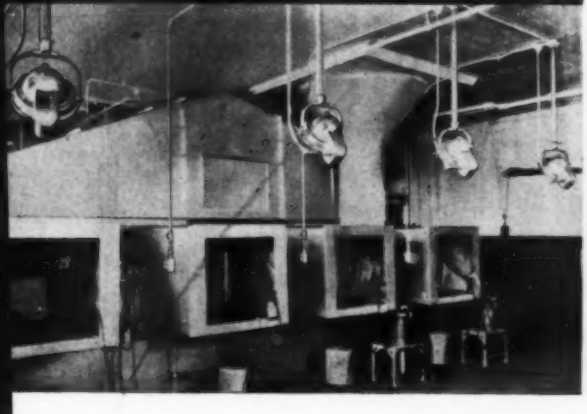
6. *Where intricate assembling slows production*—In the manufacture of radios, instruments, watches, clocks, jewelry, mechanical toys and many other products there is a complicated assembling operation. Many small parts must be inspected and assembled into intricate mechanisms. The operators' hands usually cast annoying shadows, therefore an intense illumination may be required to see into interior spaces. And the operations frequently change. Sometimes the operation covers a large area and calls for a high level of general illumination. But it is rarely possible to provide adequate relief without auxiliary local lighting and this can be justified on a generous scale by the immediate influence it has on accuracy and production.

7. *Where shadows cause spoilage*—In the manufacture of glassware, pottery, jewelry, gloves, other leather goods and many textile products, shadows are more than a handicap to the worker. They may result in errors of matching, spoilage and breakage of materials and heavy loss in rejects. Sometimes, this demands high intensity but often color factors are involved. In many cases auxiliary lighting should be provided that may be adjusted to the worker's position, so that the direction of the light may be changed when different classes of product are being handled.

8. *Where steam or vapor makes seeing difficult*—There are departments in many factories that are difficult to light because steam or vapor clogs the air. This trouble is encountered in breweries, foundries, soap works, dye works, paper mills, packing houses, chemical plants, electro plating departments and in other wet spots. The lighting is further handicapped by the need for vapor proof equipment. But the fact remains that good light is still essential for the workers. This makes an opportunity to devise some combination of general illumination and auxiliary local lighting, with perhaps a bit of extra ventilation to carry the steam away from the work spots.

9. *Where explosion hazards are present*—Safety lighting in hazardous industries provides property protection and employee safeguards. It is vital where paint, lacquer and naphtha solvents are handled, or used at paint and spray booths, also in certain portions of distilleries or dry cleaning plants. Also danger lurks at locations where dust is present in the atmosphere, such as grain elevators, textile mills, and some parts of wood-working plants.

DANGER SPOTS *for workers in hazardous industries. Here light sources must be used that will prevent explosions.*



NIGHT SAFETY *must be provided for employees in company parking lots. It stops auto pilfering, speeds worker home.*

Locklite

Simplifies AND *Safeguards* INDUSTRIAL LIGHTING

Only 2-Piece Unit that Signals when Reflector is Securely Locked in Hood

. . . Lights When It's Locked and Only When It's Locked

The new Westinghouse LOCKLITE, an exclusive electrical and mechanical connecting and disconnecting principle, simplifies lighting maintenance, offers greater safety, is easy to wire and install and provides high-efficiency industrial illumination.

LOCKLITE is available with RLM Standard Dome, Deep Bowl and Symmetrical Angle Reflectors; with the Shallow Dome Reflector and Glassteel Diffuser; and with the new RLM Silvered Bowl Diffuser . . . all manufactured by Westinghouse.

LOCKLITE units consist of the reflector, with lamp holder, and a LOCKLITE hood, with receptacle, for conduit or outlet box mounting. Positive contact between the lamp holder and the receptacle in the hood is assured when the reflector is locked in place. One hood fits all reflectors, both medium and mogul types, making all Locklite units interchangeable.

Your local Westinghouse Jobber now has these units in stock, both for demonstration and immediate delivery. Call on him for complete information; or write to Westinghouse Electric & Mfg. Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

SILVERED BOWL DIFFUSER

The NEW SILVERED BOWL DIFFUSER (available with Locklite construction) offers high-intensity, low-cost industrial incandescent lighting for close-seeing tasks. Designed for a 300-500-watt Silvered Bowl Lamp, this new reflector provides wide-spread, well-diffused, glareless illumination. Ask today to see this new unit in operation.

WHEN YOU THINK OF *Lighting Equipment* THINK OF

Westinghouse

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TELLING PASSERSBY *about the plant and product provides effective advertising, plus greater night-time safety.*

Every contractor should know the Code requirements as to types of equipment required in all hazardous industries. But it is necessary to go further into the benefits of safety as regards employee efficiency and property protection. Because of the higher cost of lighting equipment designed for use in hazardous areas, many industries have failed to provide adequate lighting in such plants. However, here are places where safe seeing should prevail. It is a rich field to explore.

10. *Where cleanliness is vital*—Lighting has a double function in plants where cleanliness is a prime factor, as in bakeries, food processing and meat packing plants, drug houses, candy and ice cream factories and bottling works. Here, in addition to adequate light for the work, there must be extra intensity to show up the smallest bit of dirt, the least neglect in cleanliness. It calls for local lighting at machines, benches and in storage spaces that supports the general lighting. And because a high intensity is needed, generous use of light sources should be recommended.

11. *Where color matching is important.*—In dyeing, printing, millinery, clothing, leather goods and throughout the textile industry color matching is essential. Also, with ice cream and other food products, it affects the market.

Manufacturers recently have placed color matching units on the market employing fluorescent tube lamps, which operate at only a few degrees above room temperature. They offer new possibilities for solving color lighting problems, where artificial daylight is needed or where lamp heat is objectionable.

12. *Where comfort and safety must be assured*—In every factory, the stairways, halls, locker rooms, elevators, yards and walkways used by employees must be made safe and secure. The best guarantee against danger of accidents is in illumination that shows up every step, every turn and prevents the accumulation of dirt or neglect of repairs.

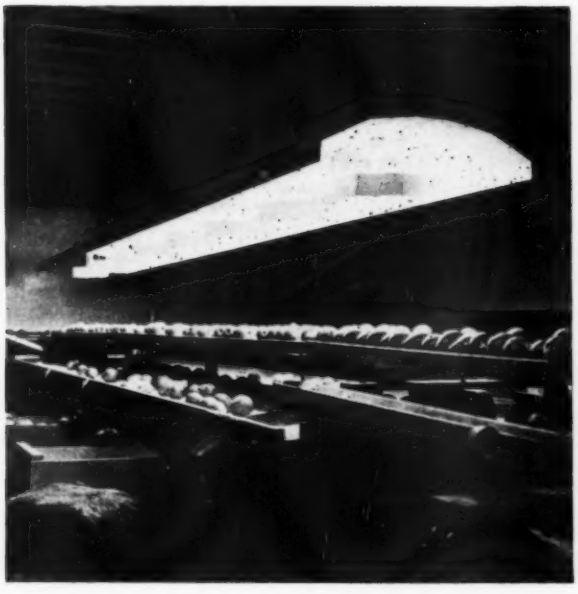
13. *Where the plant wants publicity*—Factories located near railroads or busy thoroughfares can use light on their buildings and grounds as an effective medium for night-time advertising. Floodlighted signs on buildings, water tanks and smoke stacks keep the name of a product and its manufacturer before the public.

Most manufacturing executives have given some thought to this subject, but they often lack adequate information. Exterior lighting considered in vague terms seems elaborate and terribly expensive. For this reason recommendations should strive for simplicity. They should point out the publicity advantages and combine the elements of safety to plant and surrounding grounds.

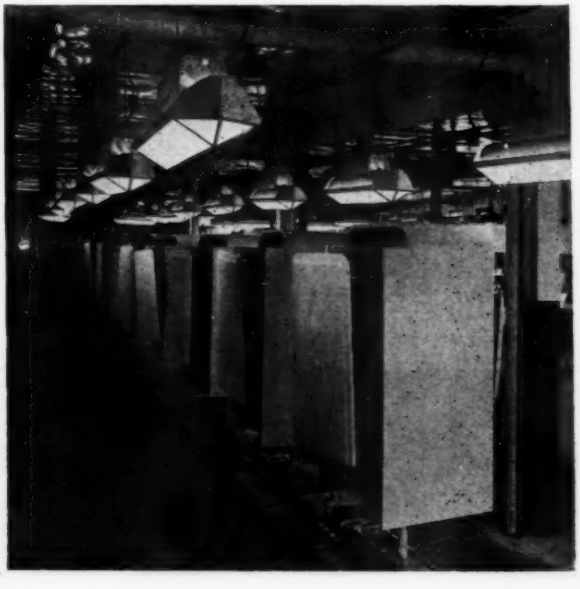
In a word, the best key to the industrial lighting market is to locate all critical seeing tasks.

In every case, it is a problem of helping the factory man with his own particular problem. And when the market for industrial lighting is approached with that attitude, what to do becomes a matter of providing required intensities, from the right angles and without glare. And because results speak for themselves, the actual selling is easy.

SPEEDY HANDLING *of farm products, in packing and shipping, depends on ability to sort and grade blemished specimens.*



FINDING FLAWS *on parts in motion, as with these enamelled cabinets, saves rejects after appliances have been assembled.*



THE SATURDAY EVENING POST
THE G-E FLUORESCENT MAZDA LAMP
THEATRES
COLOR MATCHING
SHOWCASES
GENERAL ELECTRIC presents
2 REVOLUTIONARY NEW MAZDA LAMPS
1-Light, 3 Sizes
For 18", 24"
or 36" Bulb
3-Lights
3 Sizes
For 18", 24"
or 36" Bulb
SEND for CATALOG
EFCOLITE
Announces the
New FLUORESCENT
COMMERCIAL
Interior Lighting
FIXTURES
EFCOLITE keeps abreast of the times in the latest developments in the lighting field by offering the first of a series of lighting units employing the new fluorescent mazda lamp.
The numerous lighting and color effects with fluorescent lighting opens a new avenue of sales in the residential and commercial lighting field for the wide-awake jobber who has this complete modern line to offer the "light conscious" public.
Our New Commercial Catalog includes Lighting Fixtures for all types of Interior Lighting.
EFCOLITE CORPORATION
TRENTON, N. J.

Opening FACTORY DOORS

If you want to develop industrial lighting as a profitable business, the year around, here are a few things to do in preparation.

CLEAN AND UNIFORM *quality in meat products assures steady customer demand. This shop gives the workers good seeing conditions and cashes in.*

MOST of the manufacturers in "Survey Town" failed to recall having been approached by contractors with regard to their lighting needs. It is a heavy indictment. It means that not enough electrical contractors are thinking about factory lighting to the point of cashing in.

Properly organized, however, industrial lighting can be made a steady all year activity by any contractor. For the man who does regular factory maintenance and installation work, it is easy. But to capitalize on this waiting opportunity, a few simple rules of procedure must be laid down. Here are some things to do if you want to set up year round selling in this market.

1. *Make an Industry Census*—Check up your town's factories, large and small. Consult your Chamber of Commerce, the power company, municipal licensing and inspection records, labor organizations. Size up your factories as to number and kinds of workers, approximate floor area, power consumption.

2. *Classify Production*—Set up the industries in your town by production or processing groups. Some are engaged in rough work, others in light manufacturing, some in highly specialized operations. Each has its meaning in terms of lighting needs, as to nighttime versus daytime production, safety factors and other important means of classification.

3. *Interpret Visual Burdens*—The next step is to determine which classes of industry require extremely precise lighting for critical seeing. Others plainly indicate the need for extra good illumination to help maintain cleanliness. Again there are the "high-speed" types of machine operations. In other groups there is the problem of lighting quality for providing good discrimination of color or grade of product.

4. *List Key Men*—Each factory in your town has its staff of executives, several of whom you will find directly concerned with the lighting problem. The office manager is mostly interested in modern office lighting, and is not the key man to work out factory details. So it is well to know department heads in larger plants as well as the president, or the foremen in charge of various key operations.

5. *Know Plant Problems*—To talk lighting benefits in general terms is almost as fruitless as to talk wire, conduit and panelboards. Each factory has its special operations, its peculiar processes. Your cue is to know how these functions are benefited in terms of illumination.

6. *Watch for Changes*—Plants change production layouts, buy new machinery, take on new products which call for new processes. Or they acquire additional work space. Each one of these changes introduces some kind of a lighting problem.

7. *Call on New Industries*—Many smaller industries start up without much noise. Set up your own "bureau of new industries". Watch real estate leases, building permits, cultivate the power company sales staff, and work closely with electrical wholesalers for leads as to new comers in your factory population.

8. *Notice Personnel Changes*—Promotions take place in factory organizations. Meet the new superintendents or department managers early in their new responsibilities. New bosses often like to make worthwhile changes as a part of their "taking over".

9. *Follow Process Trends*—A community sometimes swings to larger specialization in flour milling, furniture making, textiles, brewing, canning, metal working, chemicals, or some other phase of industrial activity. Train yourself also toward specialization in that field.

10. *Prepare Surveys*—Factory lighting problems today call for more than word-of-mouth selling. Build up a method of presentation based on surveys of the plant. Be equipped to make specific recommendations.

11. *Use Supporting Data*—Prove your case with experience data. The power company, the lamp men, your electrical wholesaler can all help. Have facts, figures and photographs at hand, when you make your recommendations to prove that other manufacturers have benefited by improving their lighting—and how and why and where.

SKILL CONSERVATION, *throughout the day, makes the job more pleasant for these workmen. Balanced local and general light does it.*

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DOUBLE PROFIT
IN NEW FLUORESCENT LIGHTING

for electrical contractors, dealers and jobbers

● The new G-E Fluorescent MAZDA lamps offer electrical contractors and dealers double profit opportunities . . . from the sale of the lamps and from the installation work.

For these new lamps that give several times more light than MAZDA lamps of the same wattage and color . . . and that are 50% cooler for the same amount of light . . . will be limited to sales channels, for a considerable time, that can handle the necessary installation work.

Your largest source of revenue probably will be from the daylight Fluorescent lamp. This provides the closest approach to real daylight ever produced at high efficiency. It offers many opportunities in offices, stores, shops, and factories . . . wherever color discrimination is important.

Additional profit sources will also be found in the red, gold, pink, blue, green, and white lamps that offer a wide range of decorative applications. Mail the coupon or write for complete information today!

COLOR MATCHING

REST ROOMS

THEATRES

SHOWCASES

SPECIALTY SHOP

PLACES WHERE THESE LAMPS CAN BE USED

Apparel shops	Engraving plants	Cocktail bars
Barber and beauty shops	Dyeing and cleaning plants	Dance Halls
Florist shops	Lithograph plants	Hotels
Fur salons	Wall cases	Luminous signs
Furniture stores	Architectural built-in lighting	Mirror lighting
Specialty shops	Art galleries	Show cases
Theatres	Banks	Window lighting
		Printing shops

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GENERAL ELECTRIC

TEAR OUT THIS COUPON NOW!

General Electric Co., Dept. 166-EC,
Nela Park, Cleveland, Ohio.

Please send me, without obligation, your new booklet on G-E Fluorescent MAZDA lamps.

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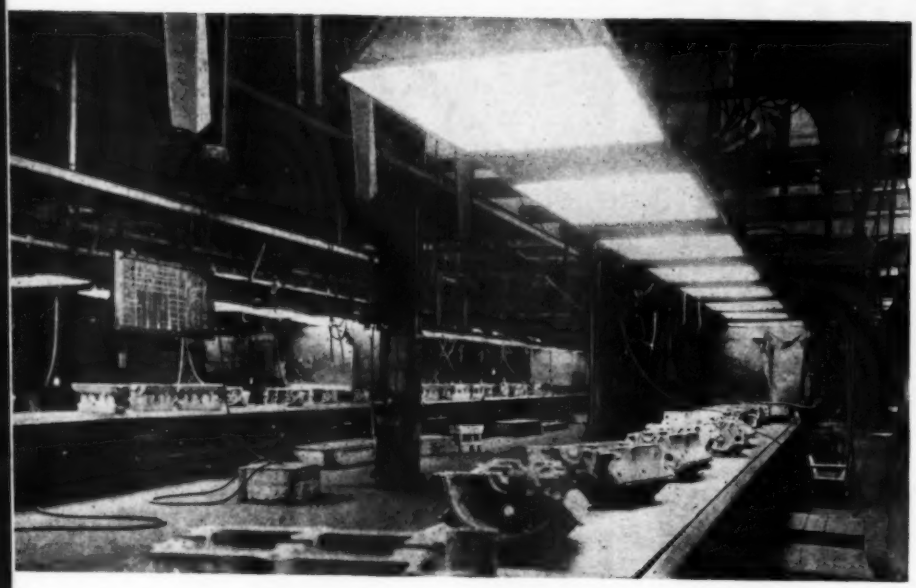


BOLD TREATMENT *for heavy castings. Intense light here has stepped up inspection efficiency and paid big dividends.*

NEW Lighting Units for FACTORIES

Equipment is available in great variety for use in industrial lighting—what to recommend—and where.

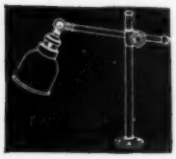
LIGHTING equipment manufacturers and illuminating engineers have developed much new equipment for industrial lighting in the last few years. Contractors should keep abreast of all this rapid progress. For lighting today is on a new basis of exact measurement. The eye has been supplanted by scientific instruments and there is a kind of light source and a type of lighting unit available for almost any need.

The initial task is one of raising general illumination from the prevailing 5 foot candles to 25 foot candles and above. And with the trend toward higher levels of illumination has come a need for the elimination of excessive brightness, contrast and glare, and the correct application of supplementary lighting. A quick review of the recent outstanding contributions to improved industrial illumination indicates how great the progress has been. And this, of course, makes it that much easier to find the right cure for lighting troubles in any factory. All this equipment is now available—

1

MERCURY VAPOR UNITS

Particularly suitable for stepping up lighting intensities because of their high light output for current consumed. The 400 watt mercury lamp produces 40 lumens per watt or slightly more light than the 750 watt incandescent lamp. The 250 watt mercury lamp produces 30 lumens per watt or about as much light as is delivered by the 400-watt incandescent lamp. These lamps produce most of their light in the yellow green and green portions of the visible spectrum near the eye's peak of sensitivity. Industrial fixtures are available in these lamps in conventional reflector shapes and housings.

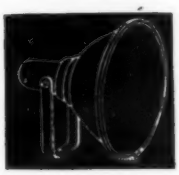


2

SUPPLEMENTARY LOCAL LIGHTING

Indispensable for many industrial processes which require good light over restricted areas that are scattered about the plant. The solution is to supplement a general lighting system with local lighting units that provide facilities for adjustment to the best working angle and minimum disturbance from shadows. A variety of such lighting units with specialized distribution characteristics has been developed.

Where supplementary reflectors must be mounted close to the working plane they can be equipped with reflectors designed for silver bowl lamps or reflecting caps to avoid direct view of the filament. With intensities of 75 foot candles and more, the shielding of direct lamp filament glare is highly important. The variety of fixed and adjustable local lighting units includes designs to meet many specific bench and machine tasks. These can be obtained with cover glasses, lenses, color correcting filters and other accessories for custom-tailoring special local lighting needs.



3

INTENSIFIER SPOTLIGHTS

For supplementing the illumination of lathe spindles, drills, tool heads and similar machine processes, where additional light is required in a highly restricted area. These are highly concentrating reflectors of 100 to 200 watt size equipped with concentric louvers to hold the light within the limited area. They are usually isolated from the point to be illuminated by mounting on the ceiling or wall, so the operator's body or moving machinery will not interfere. The beam type of supplementary spot lighting must be properly mounted and louvered to direct light at an angle that avoids shadows and glaring reflections.

4

ARTIFICIAL CEILING UNITS

A comparatively new development which involves functionally designed lighting systems and individual units. The assembly line canopy fixture is a prominent example

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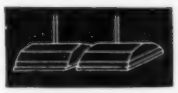
of this method. These consist of large rectangular reflectors placed in continuous rows over assembly benches or production lines. They form an artificial ceiling of high reflecting and diffusing qualities, from which high intensity light is directed down upon the work.

The lamps are enclosed in a trough suspended below the canopy in some design. Other types are equipped with silvered bowl lamps, projecting from the canopy. The basic function of this type of lighting system is to provide high intensities of perfectly diffused light at relatively high efficiency within the limits of assembly line operations. Since these units are in themselves an indirect lighting fixture with an integral luminous ceiling, such considerations as color or character of the ceiling and overhead obstructions may be ignored.



5

NON-REFLECTIVE SOURCES

Required to meet a specific demand in lighting large areas at low brightness, where work is done on shiny or highly reflective materials. For such applications, several incandescent lamps are employed in a large metal reflector to project light through diffusing glass covers of considerable area. The low surface brightness of this type unit is particularly suited for seeing tasks involving highly polished plating or shiny surfaces. With daylight lamps, daylight opal glass cover, or a combination of the two, these units are also suitable for highly critical color matching work.

Similar principles have been devised for inspecting transparent materials, mirrored surfaces or plate glass and inspection by silhouette. Here careful study must be given to the placing of light sources to meet each problem as to details of contour or form of object, silhouette effects, and surface brightness of the object under examination.

6

EXPLOSION PROOF UNITS

Where industrial operations present fire or explosion hazards, due to the presence of inflammable volatile liquids, gases or other highly flammable substances, the lighting equipment must be adequately protected. Prevention of fires and explosions must be combined with maximum general efficiency of the illumination of work areas.

Lighting fixtures have been specifically designed for such hazardous locations in various types, approved for use in the several classes of hazardous locations. These areas are clearly defined in the National Electrical Code. Fixtures designed for such area must have ample strength to withstand internal explosions without breaking down or permitting flame, hot gases or sparks to escape and ignite the surrounding atmosphere. For less hazardous locations where there are dusty processes as in grain

Land those Profitable Jobs with QUAD LIGHTING UNITS

AISLE-STOCK REFLECTORS

Aisle-Stock Reflectors are accurately formed of heavy gauge steel porcelain enameled with ground coat and two white coats inside and one green coat outside.

In warehouses, stock rooms and similar locations the illumination of shelving, bins or stacks of cartons piled high on either side of narrow aisles presents a problem that is not readily solved with conventional lighting equipment.

The Quad Aisle-Stock Reflector was designed to meet this need. This unit by means of properly disposed planes reflects a wide spread of light downward and outward to each side of the aisle, and permits the escape of direct light to the upper tiers of shelving. Effective eye shielding is obtained by a lower light cut-off angle at each end of the reflector.

QD SOCKET FITTINGS

Four interchangeable styles of QD socket fittings, including the new Type T feed-thru fitting, are available. All castings are cadmium plated and threaded to take ½ inch pipe.

QUADRANGLE MFG. CO.

32 S. PEORIA ST. CHICAGO, ILL.

Badger

Synchronous ELECTRIC TIME SWITCH

For Real Profit

$ $ $ $ $ $

Complete dependability in operation is the quality that makes these Badger time switches really profitable for you. Wire 'em and forget 'em—they will give years of satisfactory service.

The complete Reliance line includes the BADGER, RELIANCE, RACINE and the MODEL W RELIANCE—a time switch for nearly every application. Write for full information.

RELIANCE AUTOMATIC LIGHTING COMPANY

1937 MEAD STREET

RACINE, WISCONSIN

For A. C. loads up to 50 amperes. Furnished in single and double pole types and in either cast iron or sheet steel cases. $18.00 and up. Underwriters' Laboratories approved.

★

No. 1166 Straight Bracket Fixture Wired complete or unwired. ½" conduit bracket, wall flange, and lag screws—porcelain enameled reflector, green outside and white inside—porcelain socket—weatherproof.

GET MORE RURAL LIGHTING BUSINESS. . . .

OAMCO REFLECTORS

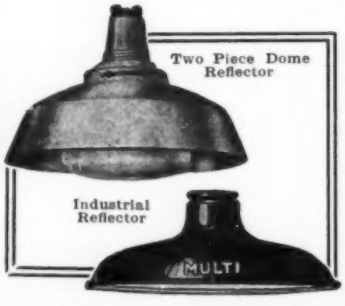
The OAMCO line of "Yardlights" (shown above) and Outdoor Flood lights (shown below) will give you many opportunities for profit on rural lighting jobs. These units can be used either indoor or outdoor and are especially adapted for lighting areaways, garages, alleyways, and farm lighting of various kinds. Listed by Underwriters' Laboratories.

No. 1139 Handy Floodlight Outdoor or indoor use. Adjustable bracket allows porcelain enameled reflector to swing in either vertical or horizontal position. Bracket and base electro galvanized. Cadmium plated socket hood. Green outside — white inside.

OVERBAGH & AYRES MFG. CO.
411 SO. CLINTON ST. CHICAGO, ILL.

MULTI REFLECTORS

For Better Lighting and Better Profits



For modern, efficient lighting in shops, offices, homes, and outdoors you can make a profit on every job by using a MULTI unit. All Multi lighting fixtures are designed to give the best results in service and in appearance. They meet a wide variety of installation needs and contractors give them hearty approval every time. Get complete information on the MULTI line now—send for our new 88-page catalog. It will be well worth your while.

MULTI ELECTRICAL MFG. CO.
1840 W. 14th ST. CHICAGO, ILL.

elevators, textile mills and clothing factories involving combustible fibers, the lighting fixtures are modified in construction.

Explosion proof and dust tight fixtures for hazardous areas are not to be confused with vapor proof or dust-proof lighting equipment. The latter designs were designed to exclude steam vapors, moisture or dirt from the lamp, fixture and wiring connections.

7
FLUORESCENT TUBES

Cool light produced by low wattage fluorescent tubes make possible industrial fixtures with unique lighting characteristics. They provide daylight seeing conditions at close work requiring color correction. To deliver high intensities at close range has always been difficult because of the annoying lamp heat produced near the worker. Fluorescent mazdas provide as much as 100 foot candles of cool illumination uniformly distributed over an area 3 ft. by 4 ft., with the fixture hung only 36 in. above the work surface.

Commercially designed fluorescent daylight units provide 3240 lumens with but 90 watts load. So the adaptation of this illuminant to industrial applications that require accurate color discrimination is possible at new low values of wattage consumption. The low surface brightness of the tubes permits the lamps to be placed in the direct line of vision without discomfort.

8
NARROW AISLE LIGHTS

In plants where stocks of material or parts are stored in racks or on shelves with aisles between, the lighting problem has been met with reflectors of special design. These units provide uniformity of illumination over the shelves and prevent glare from the lamp along the aisles. Another example of reflectors designed for specific purposes, these units have found wide acceptance for illuminating stock rooms, tool cribs, book stacks, and similar applications.

9
FLOODLIGHTS

Night time hazards are being rapidly eliminated around factories with floodlights of various types. New designs simplify the illumination of employee parking spaces, and play areas used by night workers in the larger industries. Valuable materials kept in storage yards and company streets are guarded from theft and damage by keeping them lighted. Handling of materials and machinery, outdoor maintenance, and between-building traffic can go on more efficiently when modern outdoor lighting equipment is correctly applied.

10
PORTABLE ILLUMINATION

Modern machinery does not always permit the placing of permanent lights in vital places where adjustments, lubrication or general maintenance must be performed. Likewise routine inspections must be made of the materials in various types of vats, bins and enclosures. For such requirements there are new designs for portable hand lamps, inspection lights, more durable cords and cord reeling devices, and shock-proof assemblies. These include explosion-proof, vapor-proof, acid-proof, water-proof and other special units.

DRENCHED WITH LIGHT—*This cutting table assists the workers at every point, reduces waste and speeds the process.*

ORDER FILLING *involves errors and delays unless narrow aisles have light to see parts quickly.*

– And LIGHTING Sells WIRING

Behind each factory lighting problem wait a lot of wiring jobs that offer extra profits, unseen when you begin

THE advertising done by most progressive electrical contractors implies that they can do power wiring, make motor applications, take care of emergency breakdowns, or install industrial lighting—when the customer needs him. But to get more than this casual lighting business, the contractor must create it. He must approach the factory lighting market in terms of the customer's production problems, what kinds of machines are used for various processes, and how better light will help.

When this approach is made, the contractor assumes the role of production counsel, efficiency expert. He is not just seeking employment for workmen or selling lamps and fixtures. But the net result is new wiring business—and it is away from the beaten paths of competitive job quoters.

Factory lighting and wiring go together very definitely. Every attempt to sell re-wiring to provide ample copper or more circuits, however, must be based on a logical appeal to the customer's interest. It must be expressed in terms of the definite benefits he will enjoy from the better lighting that will be provided. Yet here is some of the work that will come out of it for the contractor, if he does a thorough job of selling.

1. Respacing of outlets for correct distribution.

In big cities and small towns all over the country STER-LITES are satisfying merchants' insistent demands for better store illumination.

Just imagine intense direct light to bring out the buying appeal of merchandise, combined with diffused general illumination for visual comfort—that's the sensational sales lighting STER-LITE Louver-Controlled Direct-Lighting Units afford.

No wonder more and more merchants demand STER-LITES—no wonder so many contractors find STER-LITES the key to profitable store lighting contracts.

WRITE FOR THE NEW **Sterling** CATALOG

STERLING REFLECTOR CO
1435 W Hubbard St CHICAGO

"NAME IT AND YOU CAN HAVE IT"

In the complete line of Automatic Time Switches, Interval Timers, and Flashers, you will find units that will meet practically all of your average requirements.

Time Switches range from ten to 400 amperes per pole in capacity, and list from only $4.95 up. Flashers include all types and arrangements of circuits for every conceivable effect, and list from only $6.50 up.

TIME SWITCHES—FLASHERS
INTERVAL TIMERS

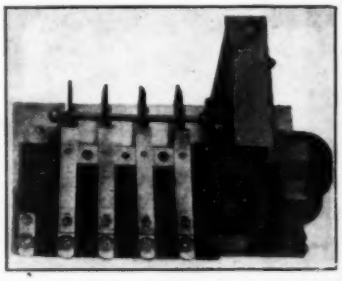
DELAYED ACTION — PROGRAM — PROCESS TIMERS

SPECIAL Delayed Action, Program, and Process Timers, and Flashers, can be furnished for practically ANY individual requirement. Just let us know what type of unit you want, what it's to be used on, the load that will be placed on it, and what you want it to do! We'll work out a unit that will meet the needs exactly, at list prices ranging from $14 up!

Write for Complete Information.

AUTOMATIC ELECTRIC MFG. CO.

MANKATO MINNESOTA



2. Placing of switches for needed trouble-free control.
3. Relief of over-taxed circuits and damaged conductor insulation.
4. Restoration and replacement of neglected panelboards and lighting load centers.
5. Refinement of controlling means for aisle and department lighting to save steps and injuries among workers.
6. Replacement of overloaded or heat-damaged feeder conductors.
7. Modernization of services and equipment to provide safe and dependable operation.
8. Maintenance or general repairs to the wiring system as a whole.
9. Installation and re-arrangement of various lighting units in harmony with the new scheme of illumination.
10. Fabrication and adaptation of special lighting applications to complex machinery units, processes, structures or enclosures.

ON THE TARGET—*Inspection here becomes more efficient and the inspector himself passes more pork with less fatigue.*

Because many of the lighting problems in factories are complicated, the contractor must be keen and alert as to machinery functions, hazards of operation, sources of waste and spoilage. Much of this information is at the tip of the factory foreman's tongue. He can be made the source of many useful ideas. Take these ideas, work out the lighting problem, and this foreman will back you when the matter is presented to those higher up.

The main point, however, is to make yourself known as a lighting man and put yourself in line for the business. And this is easy. All the knowledge of the lighting industry is at hand ready for your use. And your city is full of factories that need light.

Two *New* McGILL Guards

with NEW sales features

The New Gripon No. 1602-A

The New Loxon No. 1427-A

The new Loxon and Gripon guards are better than ever because:

1. Shape has been changed to conform to shape of the new style lamps.
2. Heavier wire is used — No. 14 now instead of No. 15.
3. Both the Loxon and Gripon may be had with or without reflectors.
4. There are NO increases in prices—only increased value for the user.

●

These are in addition to the protection against breakage and theft, the simple easy installation, and other McGILL guard features that have made them popular leaders for years.

(Listed by Underwriters' Laboratories)

McGILL MANUFACTURING COMPANY

Box 670

Valparaiso, Indiana

Maintenance

EVERYTHING IS SLIPPING

THE average man who buys a lighting installation says—"Well, that's that. We've got light." But the first day he uses it, it begins to deteriorate and his lighting requirements begin to change. His lighting must change with them or one day it is no longer good.

Men in charge of electrical maintenance know this. But they let management forget it and often they forget themselves. And all the time things are slipping. Therefore, we introduce into this series of Guide Sheets on Maintenance Practice, this discussion of lighting. Check over the chart of applications. Ask yourself—"Where has our lighting slipped behind?"

This series of articles began in January with a frank review of the electrical maintenance man's job. Then came—

1. ALTERNATING CURRENT MOTORS—Types and Applications
2. DIRECT CURRENT MOTORS—Types and Applications
3. ALTERNATING CURRENT MOTORS—Maintenance
4. DIRECT CURRENT MOTORS—Maintenance
5. A.C. MOTOR STARTERS AND CONTROLLERS—Types and Applications
6. D. C. MOTOR STARTERS AND CONTROLLERS—Types and Applications
7. MAINTENANCE OF CONTROL EQUIPMENT
8. SPECIAL CONTROL PROBLEMS—Heavy Installations and Maintenance
9. ELECTRIC DISTRIBUTION—Circuit Protection—Power Factor Correction
10. LIGHTING—Applications and Maintenance (this issue)

Coming articles will discuss

11. ELECTRIC HEAT—Types, Applications and Maintenance
12. ELECTRIC WELDING—Types, Applications, Control
13. INTERPLANT COMMUNICATION—Types and Common Maintenance Problems
14. INSTRUMENTS—Types, Application, Care
15. POWER TOOLS—Types, Application, Care
16. BATTERIES AND RECTIFIERS—Types and Maintenance
17. ELECTROPLATING—Maintenance Aspects
18. ELECTRONIC DEVICES—Types and Applications

The Maintenance of Lighting

THE responsibility of the maintenance man in any factory, as it applies to lighting, is clear. It is tied directly into the six chief purposes of lighting itself which are—to reduce accidents, increase production, improve quality of product, improve working conditions, reduce cost and utilize space. And good lighting depends upon the proper selection, application and maintenance of the equipment used in the lighting system.

In the selection of equipment, the following factors should be considered: (1) adequacy of quantity of light, (2) suitability of quality of light, (3) minimized direct and reflected glare, (4) avoidance of harsh shadows, (5) elimination of contrast of lighted objects and backgrounds, and (6) ease of cleaning and maintenance.

Many types of light sources are available for industrial lighting. There are too many varieties to even mention here. But the sources commonly used are listed in the chart on page 43.

Why Accessories?

Light from a bare lamp does not produce what we know as illumination. To put raw light to work requires the use of reflectors or enclosing glassware. And such accessories should not only redirect light into useful angles, but should also serve to modify the brilliancy of the light source. The maintenance man therefore, must employ the full scope of this auxiliary equipment, to make the raw light do the work he wants it to. To this end a review of these facilities is worthwhile.

In redirecting and screening light two classes of accessories—opaque and translucent—are generally used. Opaque reflectors transmit none of the light, but reflect or absorb. Translucent substances transmit the light and scatter it. And now comes polarization—another method of controlling light. This method has been developed recently and is comparatively inexpensive to use. Crystalline substances arranged on transparent material permit light vibrations in one plane to pass. When the planes of polarization are parallel light is also passed through two screens. But it is stopped when the planes of polar-

GRADERS *at Atlanta Oak Flooring Co., Atlanta, Ga., can detect pin worm holes and machine imperfections as far as 16 ft. away. Combination mercury and incandescent lamps provide uniform "daylight." (G. E. Vapor Lamp photo)*

THEY'RE MOUNTED HIGH—*Dust-tight high-bay lighting units, each using a 1,000-watt lamp, provide illumination for the transfer bay of General Steel Castings Co., Eddystone, Pa. Units are mounted 50 ft. above the floor and spaced 32 ft. apart. Light intensity is 15 foot-candles.*

ization in the two planes are at right angles. In a word, a new device has been created for the prevention of glare that will soon play an important part in the lighting of work spaces.

Choice of Reflectors

For general lighting in industrial plants the reflectors most commonly used are—RLM (Reflector and Lamp Manufacturers) standard dome, Glassteel diffuser, shallow dome, deep bowl, and angle reflectors. (*See Electrical Contracting, October 1937, page 129*). But Intensifiers, bowl reflectors, projection lights, and canopy or hood units are forms of supplementary lighting that are also available. In some installations the canopy unit is extended to provide illumination on long assembly tables.

Further special applications for reflectors are:

1. Aisles and bins in stock rooms.
2. Overhead illumination at open kettles and mixers where vapor-proof fixtures must be used.
3. Locations where combustible dust exists, in which case dust-tight fixtures are recommended.
4. Operations or locations which present fire or explosion hazards, where explosion proof fixtures must be used.

Lighting Units

In industrial plants, lighting roughly divides into general lighting that provides a uniform level of illumination for the entire room, floor or department, and supplementary lighting that provides higher levels of illumination for better seeing at certain points.

For general illumination luminaires or lighting units group into four types—

1. *Direct*—which throws about 90 per cent or more of the light downward.
2. *Semi-direct*—which throws between 40 and 90 per cent of the light downward.
3. *Semi-indirect*—which throws about 60 per cent or more of the light upward, and the remainder of the light passing through the lower section of the unit.
4. *Indirect*—which throws 90 per cent or more of the light upward.

For supplementary lighting direct lighting units are used, equipment designed for the purpose. The units are mounted permanently or on an adjustable bracket near the work, or at a remote location as on a ceiling.

Blue glass covers for attaching to reflectors, "daylight" incandescent lamps, combination incandescent and mercury vapor lamps, carbon dioxide lamps, daylight white fluorescent lamps, all are available for color correction or color matching. Their proper use is all part of the maintenance man's job, and ample guidance is obtainable from the manufacturers and lamp men.

Effect of Voltage Changes

The suiting of lamps to the existing voltage is highly important in lighting maintenance. In general lighting service incandescent lamps produce light most satisfactorily and economically when operated at their rated voltage. For a 5 per cent reduction in voltage, the light loss is 16 per cent. True, the life of the lamps is increased about 60 per cent, but the cost of producing light is increased.

Incandescent lamp operation at overvoltage has an opposite effect. The light output increases but the life decreases. There are places where operating incandescent lamps at higher voltage is desirable, however, as in the sports lighting field. Here lamps are operated at about 10 per cent overvoltage for only 100 or 200 hours a year.

Low pressure mercury vapor lamps (Cooper Hewitt) are designed for maximum efficiency at rated voltage. If operated at 5 per cent under rated voltage, the light output is reduced 17 per cent. If operated at 5 per cent above rated voltage, the light output is increased 9 per cent. Therefore, connections should be made to the transformer tap corresponding to the supply voltage.

High intensity mercury vapor lamps (Type H) also are designed for maximum efficiency at rated voltage. If the voltage changes 5 per cent the light output changes 11 per cent. When lamps are operated at 5 per cent or more under rated voltage, they approach

What Voltage Does to Light

120-Volt Lamps Operated at (Volts)	Per Cent of Normal Voltage	Per Cent of Normal Light Output	Per Cent of Normal Watts	Per Cent of Normal Efficiency
120	100.0	100.0	100.0	100.0
119	99.2	97.3	98.8	98.2
118	98.3	94.4	97.4	96.9
117	97.5	91.8	96.1	95.4
116	96.7	89.2	95.0	93.8
115	95.8	86.4	93.6	92.3
114	95.0	84.0	92.4	90.8
113	94.2	81.5	91.2	89.4
112	93.3	78.0	89.8	87.7
111	92.5	76.6	88.7	86.2
110	91.7	74.1	87.5	84.8

LAMP EFFICIENCY VS. VOLTAGE—*Table shows what actually happens when large incandescent lamps are burned below rated voltage.*

UMI

LIGHT SOURCES—Types, Characteristics and Applications

Commercial Designation	Incandescent	"Daylight" Incandescent	Low Pressure Mercury Cooper Hewitt	High Intensity Mercury Type H	Combination Cooper Hewitt and Incandescent	Combination Type H and Incandescent	Sodium	Fluorescent
Light source	Tungsten Filament.	Tungsten Filament.	Mercury vapor. Linear (33 and 50 in.)	Mercury vapor. 250 watt 8 in. 400 watt 13 in.	Mercury vapor and tungsten filament. Cluster and linear	Mercury vapor and tungsten filament. Cluster	Sodium vapor. Requires vacuum flask. Short linear, 12 to 16 in.	Small amount of mercury and argon gas.
Color of emitted light	White, emphasis on yellow-red	Approximates white, approaches daylight	Blue-green	Blue-green, emphasis on yellow-green	Blue-white	Yellow-green white	Yellow	Daylight, white, red, pink, gold, green, blue
Rated average life of lamps	Up to 300-watt, 750 hours; 300- to 1,500-watt, 1,000 hours	750 hours	6,000 hours	2,000 hours	See respective components	See respective components	2,000 hours	1,500 hours
Lamp efficiency (rated initial lumens for bare lamps burned at rated voltage and frequency)	15 to 20 lumens per watt, average 18, for 100- to 1,500-watt lamps*	Average 11 lumens per watt for 100- to 500-watt lamps*	Watts Lumens† 275 (33 in.) 4,800 350 (50 in.) 6,800	Watts§ Lumens† 250 7,500 400 16,000	Watts (total) Lumens† Cluster type 550 10,440 Linear type 875 15,120 950 17,120	Watts (total)§ Lumens† 450 11,140 600 19,640	Watts§ Lumens† 135 and 145 6,000 180 and 200 10,000	Watts Ratings: 15 20 30 Color Output. Lumens Per Watt Daylight ..... 30 32 35 White ..... 33 32 35 Red ..... 3 3 3 Pink ..... 23 22 23 Gold ..... 18 19 21 Green ..... 60 65 73 Blue 18 19 21
Connected to power circuits	Multiple on d.c. or a.c.	Multiple on d.c. or a.c.	Multiple on d.c. or 60 cycles a.c.	Multiple on 60 cycles a.c.	Multiple or separate on d.c. or 60 cycles a.c.	Multiple or series on 60 cycles a.c.	Multiple or series on 60 cycles a.c.	Multiple on 60 cycles a.c.
Accessories required	Self contained	Self contained	Ballast transformer	Ballast transformer	Ballast transformer	Ballast transformer	Ballast transformer	Choke coil and starting device
Characteristics	Continuous spectrum; shows up practically all colors. Inside frosted; minimizes direct glare of filament. Light absorbed by inside frosting is negligible (lumens output is rated same as for clear lamps).	Continuous spectrum. Approaches daylight. Corrects unsatisfactory mixture of ordinary artificial light and inadequate daylight. Additional special blue glass required to simulate north light.	Line spectrum, two colors. Free from glare. Practically eliminates shadows Psychologically cool.	Line spectrum, two colors. Twice as much light (lumens) per watt consumed as for metallic filament incandescent lamp. Emphasizes detail. Appears white to observer but lacks red rays. Comparatively cool. Radiant heat is 50 per cent less than other artificial illuminants.	Continuous spectrum, emphasis on line spectrum of mercury light. Reduces distortion of colors. Correctly proportioned mixture of mercury and tungsten light approaches white light.	Continuous spectrum, emphasis on yellow-green. Color distortion reduced by light of incandescent lamps. Incandescent lamp provides part illumination until mercury lamp burns. Correctly proportioned mixture of mercury and incandescent light approaches white light.	Line spectrum, one color. Free from objectionable glare. Soft diffused light. Color contrast entirely obliterated. Silhouettes strong and clear-cut. Requires 20 min. to attain full output. Acceptable lighting reached within few minutes after starting.	Band spectrum. Produces little visible light, but is rich in invisible ultraviolet radiations. Effect of radiations on chemical compounds on inner wall of tube generates the visible light. Efficient in production of white and daylight quality light, as well as colored light.
Applications	Direct, semi-indirect, and indirect lighting. Most general lighting purposes— Industrial, Commercial, Domestic, Floodlighting.	Direct, semi-indirect, and indirect lighting. Color correction. Local lighting for sewing machines, special assembly, and inspection processes. Some general lighting for psychological effect (cooling).	Direct lighting. Where distortion of color is not objectionable. General lighting for manufacturing areas. Applications where long source of light is desired. Where fine detail has to be observed.	Direct, semi-indirect, and direct lighting. Used with fixtures specially designed for the lamp. Where distortion of color is not objectionable. General industrial and commercial lighting. Outdoor floodlighting. Highway and street lighting.	Direct lighting for general industrial use. Semi-indirect and indirect lighting for commercial and industrial use. Where approximation of daylight is desirable.	Direct lighting for industrial, highway and street use. Semi-indirect and indirect for general illumination in offices, schools, drafting rooms and other areas. Where approximation of white light is generally desired. Not suited to color matching, due to emphasis on green.	Direct lighting. Where distortion of color is not objectionable. Illumination for large outdoor areas as yards, receiving and shipping platforms; highways; grade crossings; bridges; railroad yards; aviation field boundaries.	For intense close-to-bench lighting where radiated lamp heat should be avoided. For direct, semi-indirect and indirect, for commercial lighting such as decorative, architectural built-in, theatre interiors, specialty shops, art galleries, coves, show cases, private offices, luminous signs, beauty parlors, drug stores, mirror lights. Daylight for commercial color matching.

NOTES * For 115-volt lamps when burned at rated voltage.
§ Rated watts of lamps. Power consumed by accessories is not included.
† Lumens output of lighting unit depends on type of reflector and diffuser.
‡ By using colored glasses other colors present in spectrum may be obtained.

a point of instability and may drop out on voltage dips. Lamps should be connected to transformer taps for voltage not over 5 per cent above or not more than 2½ per cent under line voltage.

Fluorescent lamp light output is not affected by variation in line voltage, to the same extent as filament lamps. But, in general, with the ordinary type of auxiliary using no capacitance, a 1 per cent change in line volts means a 2 per cent change in light output.

Effect of Wiring

Efficient and economical production of light requires wiring of sufficient capacity to carry electrical energy to the lamp sockets without excessive voltage drop. Wiring recommendations include 2 volts maximum drop for branch circuits, and the same for service and feeders.

The exact method of figuring the load and capacity of conductors is to use foot-candle values as a basis. These values should not be lower than present acceptable standards of the Illuminating Engineering Society. For only estimating purposes, the "watts per square foot" method may be used. Values are given in Table II of the Handbook of Interior Wiring Design (1937).

Control of Lights

The modern method is to install a master switch for as many as eight circuits on general illumination in a department. Some plants install skip-stop circuits to permit one light to burn in every four circuits, as a safety factor for the night watchman.

Photoelectric control can be connected in certain circuits for general illumination. By its use the lights are turned on and off automatically according to the strength of the sun light. So light intensity is equalized during working hours, which eliminates uneconomical operation of lights when daylight is sufficient. For signs, floodlights and other outdoor lighting, chronologic or astronomic time switches or photoelectric control can be used.

Floodlighting

Floodlighting for exterior illumination may be applied for advertising value decoration, night-time sports, protection of property, construction work, yard and platform work, and other purposes. So each proposed floodlighting installation is an individual study. It includes a variety of widely diverse factors, that require separate calculations. When planning an installation, therefore the maintenance man should refer to procedures given in handbooks and catalogs of equipment manufacturers.

CLEANING OR RENEWAL *of lamps and reflectors is simplified by use of a fixture changer. Jaws are adjustable from bottom of shaft. (Benjamin Electric Mfg. Co. photo)*

Usually the flood lights are intended for yard areas, buildings and parking spaces. But if color is to be added, light absorption values and increased wattage must be taken into consideration. When figuring on floodlighting installations of this type it is well to have a check made by an illuminating engineer to obtain the desired effect.

Open type flood lighting units consist of a lamp mounted in a porcelain enameled reflector for narrow-, medium-, and wide-spread beams.

Enclosed type flood lighting units embody a lamp mounted in a metal housing, furnished with a reflecting surface such as silvered glass or aluminum, and covered with clear, ribbed, stippled or colored glass. They provide various beam spreads, and some have focussing mechanism.

The setting up of a definite cleaning schedule for reflectors of floodlight units, of course, will depend on conditions. Reflectors should be cleaned once a month in those industrial locations which are dusty and sooty. Lamps should be replaced whenever they appear excessively black. Where open type floodlights are used, lamps should be protected either by cover glasses, using reflector deep enough to shield lamp, or using a hard glass lamp.

As a protection against theft of lamps, lock sockets and left-hand threads have been used. Where units are low, a grille work with a lock is a partial protection, although this will reduce the light output to some extent.

The maintenance of lighting boils down to about eight key points. Follow them and there will be little trouble in the lighting system of any factory or commercial building.

Key Points of Maintenance

These important maintenance points are—

1. To insure obtaining light at a low unit cost, the lamp and socket voltages should correspond as closely as possible.

2. If a lamp is badly blackened, it will be economical to replace it when the unit is being cleaned.

3. Power and light loads should be separated wherever possible. If 230-volt installations are employed, they should be changed wherever practicable to 115 volts to gain the advantage of lower voltage lamps.

4. To avoid the inconvenience of stocking many sizes of lamps and to minimize the possibility of mistakes when installing them, some thought should be given to the use of only one lamp size in the department or plant.

5. To insure satisfactory operation of lighting, it is necessary to establish a maintenance system based upon readings with a meter for measuring light intensity. When the equipment is clean the maintenance man should take readings and ascertain the amount of light being delivered to the work area. Periodic checks will enable him to establish a definite cleaning schedule.

6. The best all-around method for cleaning lighting units is to use soap and water. In locations where only dry dust and smoke accumulate on lighting units, satisfactory results are obtained by washing the units at one cleaning period and merely wiping them with a damp cloth on the next cleaning period. This cleaning schedule is recommended—

Type of Lighting Unit	Character of Location	Days Between Washings
Direct and.....	Very dirty.	7
Semi-direct.....	Dirty.....	15
	Average...	30
	Clean.....	60
Semi-indirect.....	Average...	15
and Indirect.....	Clean.....	30

7. Where disconnecting devices are employed, the maintenance man should have an extra lighting unit available. The clean unit is substituted for the dirty unit. The replaced unit is cleaned and substituted for the next dirty one. In lieu of step ladders, a long shaft with adjustable prongs can be used to replace lighting units.

8. Where shock and vibration reduce lamp life, the condition can be greatly minimized by the use of shock—and vibration-absorbing hangers and sockets. Special vibration and rough service lamps are also obtainable.

RLM'S CONTRIBUTION *to the growing* INDUSTRIAL DEMAND *for better* BUYING STANDARDS

A NEW BOOK! *"The Meaning of the* RLM *Label"*

Today more than ever before, those who purchase and specify products for use in industry are insisting upon basic standards by which they may judge accurately the value of the product from quality and performance standpoints.

In the field of Industrial Light Conditioning, the RLM STANDARDS INSTITUTE is meeting this demand by establishing standards of efficiency, design and quality for Industrial Lighting Reflectors.

The necessity for these standards, what they are and how they may be used to insure proper specification of lighting equipment from both the viewpoint of cost and performance is the subject of the booklet—"The Meaning of the RLM Label."

Into the book has gone the composite experience and knowledge of the engineering departments of the leading manufacturers of lighting reflectors associated in the RLM STANDARDS INSTITUTE.

This book is available without cost to industrial executives, consulting engineers, illuminating engineers, plant engineers, purchasing agents and all others interested in the proper specification and installation of industrial lighting equipment. Your request for a copy is most cordially invited.

The letters RLM stand for Reflector and Lighting equipment Manufacturers

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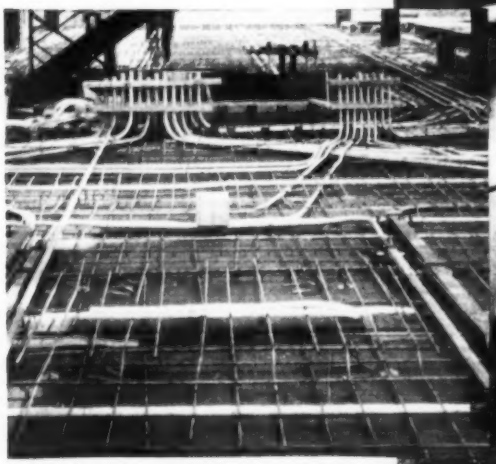
Detroit Edison Service Building, Detroit, Mich. Architect and Engineer: The Detroit Edison Company. General Contractor: Walbridge Aldinger Company. Electrical Contractor: John H. Busby Company.



More than 100,000 feet of ELECTRUNITE *Steeltubes in sizes ¾-inch to 2-inch were installed in reinforced concrete construction. Note the neat, uniform bends made on the job. No factory elbows were used.*

ES CONCRETE?... *Absolutely!*

If you are doubtful about the use of ELECTRUNITE Steeltubes in concrete construction, look at this job—the Detroit Edison Service Building. In wiring it, the John H. Busby Co., Detroit electrical contractor, installed more than 100,000 feet of this modern threadless conduit in reinforced concrete construction.

This is not the first time that Detroit Edison Company engineers have had experience with ELECTRUNITE Steeltubes in concrete. That they were entirely satisfied with its past performance was evidenced by its use in this new office building.

You, too, will find ELECTRUNITE Steeltubes safe, sound and economical for concrete as well as exposed wiring.

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Look for this label. It is found only on genuine ELECTRUNITE Steeltubes.

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This modern bender—which makes full, round, smooth bends easily, quickly and without flattening or wrinkling—enabled the contractor to save the cost of 1,000 factory elbows and 1,500 couplings on this job.

The new Hossfeld bender—with a full set of dies for ½-inch to 2-inch ELECTRUNITE Steeltubes—will soon repay its cost of $75.00. *Ask your Steeltubes salesman for details.*

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Probably the greatest advance in design of electrical control equipment has come in the field of relays. Ward Leonard has pioneered this work giving relays that are more desirable, more positive, more sensitive and at the same time that operate with less electrical loss.

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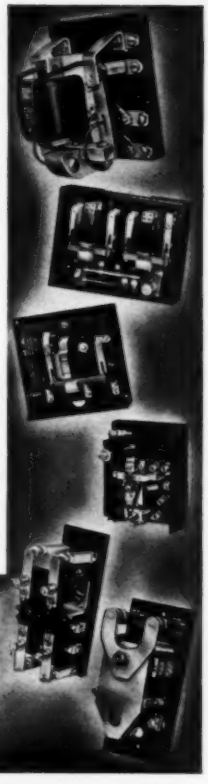

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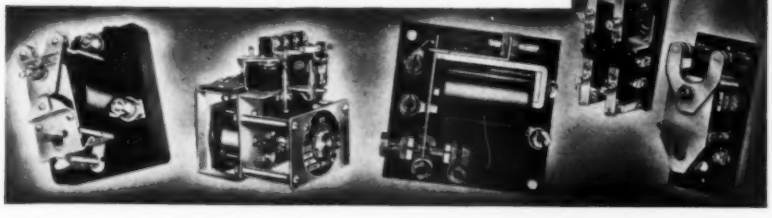


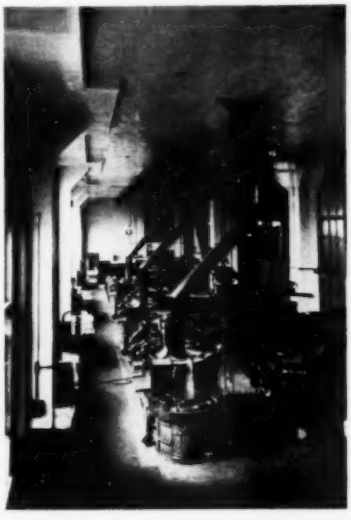
"Here It Is"

● It is just as easy to get the electric motor bearing you want as it is to find it in the new Bunting Catalog, which lists bearings always in stock for all makes of motors from 1/50 hp to 100 hp...Write for your copy. . . The Bunting Brass & Bronze Company . . . Toledo, Ohio. Warehouses in All Principal Cities.

BUNTING Bunting Quality
BRONZE BUSHINGS • BEARINGS
PRECISION BRONZE BARS
BABBITT METALS

Manicuring Stereo Metal Pots

No small maintenance job is that of "manicuring" three 340-kw. melting pots that melt "dead" stereotype metal taken off the big presses in the New York Daily News plant. Each pot has thirty-four 10-kw. electrical heating elements. Casting boxes in connection turn out plates to the tune of four per minute, each. The pots operate at 550 deg. F, and are automatically maintained at this temperature by means of delicate instruments and relays. A remote switchboard houses the magnetic



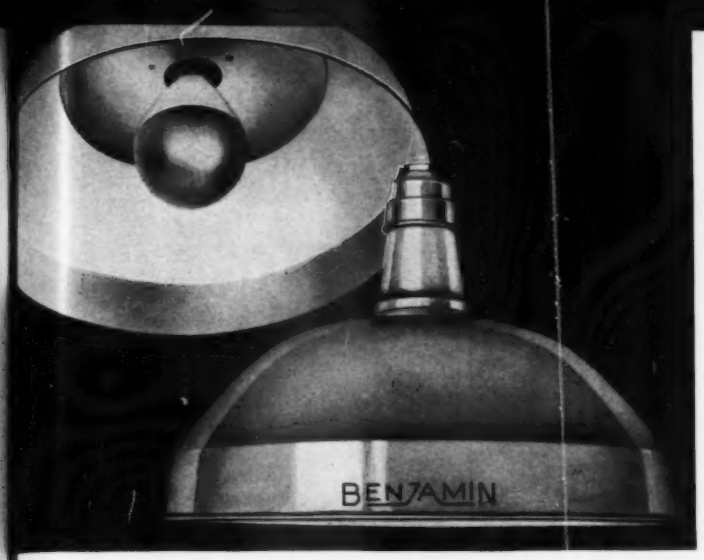
MELTING POTS MAINTENANCE— Weekly attention provides efficient electrical heat for melting stereo metals in a metropolitan newspaper plant.

contactors which automatically throw in the 340-kw. heating load in two successive load steps. Each contactor in turn has magazine fuses for the individual feeders to its group of 10-kw. elements.

This equipment is completely gone over every week. All contacts are cleaned and properly seated, relays are tried out and adjusted, fuses and cable connections are checked. It is a weekly "must" for the electrical maintenance force. If this work is not completed on the day it is scheduled to be done, a written report of explanation must be filed with Chief Electrician John Peters.

Now Paper Can Be Cut Straight

A method to prevent paper wavering from the "straight and narrow path" in the cutting operation has been reported by F. H. Gulliksen, electronic control engineer of the Westinghouse



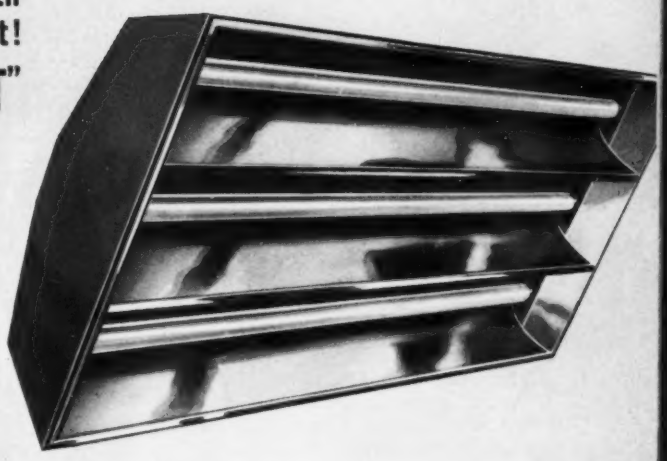
Show Your Customers How to Secure Indirect Lighting Effects with the NEW BENJAMIN RLM "Silvered Bowl" Diffuser

Benjamin introduces a new lighting reflector specifically designed to utilize the indirect lighting characteristics of the silvered bowl lamp. The new unit makes more effective use of the silvered bowl lamp by means of a distinctive innovation in diffuser design, and thus provides a greater degree of EYE COMFORT at a low initial and operating cost.

The new unit produces softer, better diffused illumination with less sacrifice to high lighting efficiency, due to the unique combination of Alzak Aluminum and porcelain enamel reflecting surfaces and the full utilization of the indirect lighting qualities of the silvered bowl lamp. Write for complete information concerning this newest development in Industrial Light Conditioning.

Something New That Every One of Your Customers With A "Daylight" Illumination Problem Should Know About!

The NEW BENJAMIN "DAYLIGHT" FLUORESCENT LAMP DIFFUSER



This new Benjamin unit was especially designed to operate with the new fluorescent type lamp. It provides greatly improved illumination for those localized operations requiring light with "color corrective" qualities.

With this new unit, "Daylight" lighting is improved four ways. *First*, never before has it been possible to produce at this low cost "Daylight" illumination of such high quality; *second*, this improved "Daylight" lighting is produced without the usual absorption waste necessary when incandescent lights are corrected for this purpose; *third*, the new lamp has a much lower surface brightness and *fourth*, generates practically no radiant heat, hence units may be mounted low over the working plane without discomfort to worker. A truly remarkable advance in lighting! Mail Coupon for Catalog Sheets with complete information.

NEW IMPROVED BENJAMIN ALZAK UTILITY FLOODLIGHTS OPEN UP NEW SOURCES OF INCREASED BUSINESS FOR YOU

In these new, inexpensive, Benjamin Utility Floodlights are most of the outstanding quality features usually found only in the costlier floodlight projector equipment. Such features include weather-proofness, durability, high lighting efficiency, beam focusing arrangement, heat resisting glass covers and quickly removable cover bands. *Both* the inner reflecting surface and the outer surfaces are of highest quality Alzak Aluminum.

The new increased size range in which the Utility Floodlights are available, enables you to meet most of the requirements for general purpose and decorative floodlighting with these new units. The new sizes are: 150-200 Watt, 300-500 Watt, 1000 Watt. In all these sizes the units are available in either the concentrating or wide beam type, with choice of 6 kinds of mounting brackets and 3 kinds of cover glass. For complete details, MAIL COUPON.

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Your jobber will demonstrate Prest-O-Lite Torches and Soldering Irons. Call him—or write the Linde office near you.

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Electric & Manufacturing Company, Pittsburgh, Pa. The equipment utilizes a single phototube, amplifiers and a small reversible motor to follow a narrow guide line on long rolls of paper. This set-up makes it possible for paper to be wound evenly from uneven rolls and slit in perfectly straight lines.

Light from a small lamp passes through four small circular lenses, revolving 1800 times a minute on the shaft of a synchronous motor, and strikes the roll of paper as four rapidly revolving light beams. This light is then reflected back to the phototube whose resistance increases as the illumination from the paper decreases.

As long as the light beam strikes only the light surface of the paper roll, the resistance of the phototube remains uniform. But as soon as the beam intercepts the dark-colored guide line on the paper roll the phototube gives a signal to a reversing motor. A gear arrangement adjusts the position of the unwinding roll transversally to bring it into a straight line again. The phototube controls the operation of the reversible motor by means of a high vacuum amplifier and sequence interlocked thyratron tubes, supplying armature voltage to the motor.

AUTO PLANT MINUTE MEN— *Spare motors play an important part in maintaining steady production of Packard Motor Cars. This view of the motor stockroom in the Detroit plant suggests the variety of types and sizes involved. Here, from 250 to 300 motors ranging up to 100 hp. are kept ready for an SOS after first having been put in the pink.*

Quiet Units Air Condition Movie House

Quietness was a requisite for the three condensing units of an air conditioning system in the Isis Theatre, Fort Worth, Texas. The theatre has no basement. The only place for the three units was overhead 25 ft. above the stage floor and directly over the screen and sound equipment.

Every precaution was taken to pre-

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With the famous powder-packed element
KANTARK "ONE-TIME" FUSES
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B-M fittings are so much lower in price that the savings on the first job will more than pay for the Indenter required. Our tools and method of fastening the fittings to the tubing are patented, and we limit the license of our tools under these patents to the installation of our fittings only.

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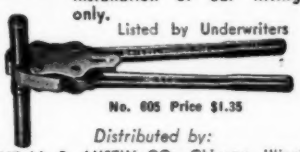

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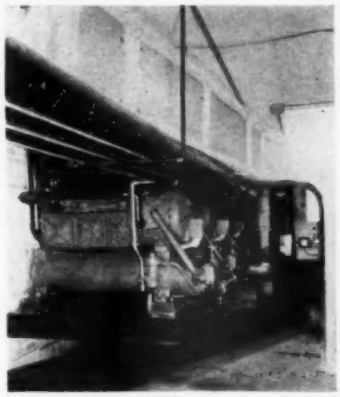
vent sound or vibration entering the theatre proper. So a steel structure supporting the units, is isolated from the building. When the three condensing units are running, no sound is audible in the theatre.

These Westinghouse units produce dry, crisp air in the theatre. An aver-



QUIET—*These three condensing units are mounted on a steel structure 25-ft. above the stage, maintain 76 deg. F. inside the Isis Theatre with 100 deg. F. outside temperature. (Westinghouse Photo.)*

age temperature of 76 deg. F. is maintained when it is 100 deg. outside. The relative humidity has not exceeded 50 per cent, even with 1,000 people in the theatre. The system is controlled automatically, and is started and stopped manually from a push button.

High Intensity Local Lighting

Several types of lighting fixtures are available for local illumination at machines. With one fixture the light rays are reflected into a converging beam which is brought to a focus about 15 inches in front of the reflector.

Comparative tests made at a distance of twelve inches from the work surface show that (1) a bare 60-watt lamp provided an illumination of 57 foot-candles and (2) when the lamp was used with the reflector over 300 foot-candles was provided.

Maintenance of Oil Switches

Oil switch operating mechanisms used with high voltage equipment should be inspected at least every six months. At the same time, severely pitted contacts should be renewed, and all connections and bolts tightened.

When switches are in continuous use and have been operated frequently, it

23 MOTORS ONE CONTROL BOARD . . .

TYPICAL OF CLARK EFFICIENCY AND SIMPLICITY OF INSTALLATION

● This 6'6"x14'6" panel operates 23 motors ranging from ½ H.P. to 2 H.P. in a Mid West Sewage Treatment Plant. All motors are operated and protected by "3C" Bulletin 6013 Across-the-Line Starters with fused Main Line Knife Switch Protection. All motors have transfer equipment so set that if the motor generator supply fails, the motors automatically transfer to Power Company supply. Restoration of Generator supply automatically restores motors to that service. This installation is typical in neatness, simplicity and efficiency of hundreds of "3C" Sewage Disposal and Water Works plant controls.

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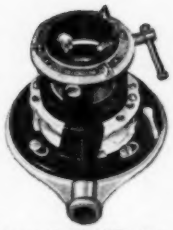
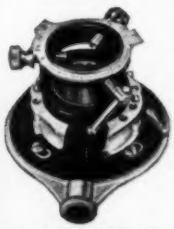


New RIDGID No. 65RC with can type workholder.



New RIDGID No. 65RP with plate type workholder.

Rugged new RIDGID No. 65R All-Steel Malleable Alloy Die Stock, *with drop-forged hardened tool-steel cam plate, threads 4 sizes of pipe with 1 set of chaser dies.* Your choice of 2 new mistake-proof workholders. Buy it—for quicker easier better threading at lower cost. Ask your Supply House.

The Ridge Tool Co., Elyria, Ohio

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Easily, quickly and dependably from these

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INSULATION INCORPORATED

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is good practice to change the oil every year. If the switches were opened by short circuits or overloads, a special inspection should be made and oil changed every six months. Condensation or rust on the inside of the switch cover is a good indication that the oil should be changed.

Carbon is another source of trouble. It is visible in oil and is a contributing cause when switches heat up under load. Black deposits on porcelain bushings are an indication of the presence of carbon.

Does the Motor Overheat?

Motors will operate continuously and perform their duty faithfully. However, when they get a "fever" the "doctor"—is called. Here are a few points to be checked by the maintenance man—

(1) Does the voltage at the motor terminals correspond to the nameplate voltage?

(2) Is the frequency of the power supply the same as the frequency stamped on the nameplate?

(3) Have operations on the driven machine been changed which result in a different duty cycle for the motor?

(4) Has the motor been blown out and the bearings inspected?

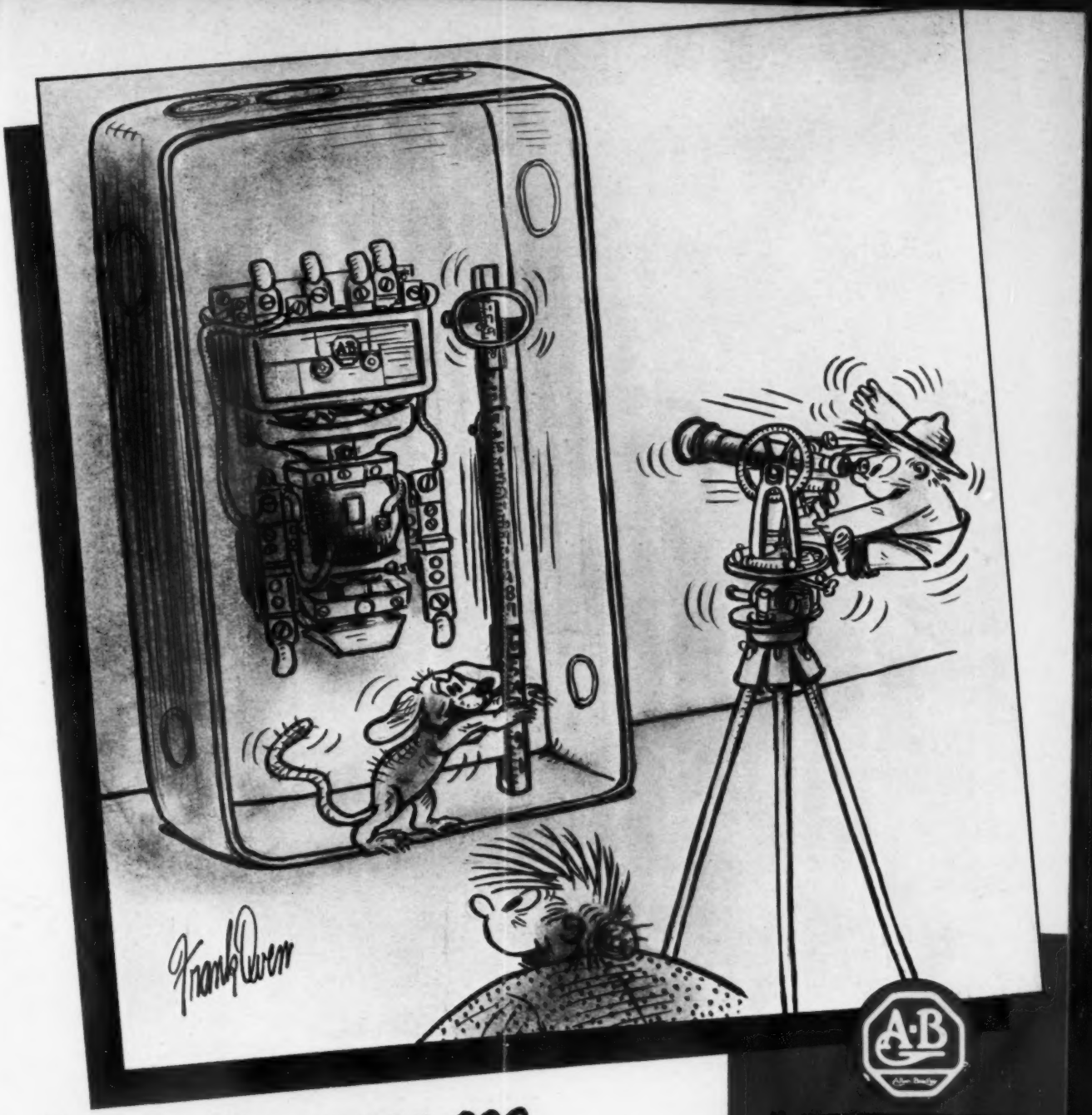
(5) Has the air gap been checked on all sides of the rotor?

Lamp "Failures" Cease

A maintenance man for a large oil company, operating in Texas, tells how lighting was maintained for a loading rack. Somebody had been stealing lamps from a long loading rack where products for shipment were run into tank cars. Even with vapor-proof glasses over them, the lamps would disappear. The trouble was aggravated by the fact that only a portion of the rack—that where cars were loaded—would be switched on; the others remaining dark. Absence of lamps could not be noted until they were needed.

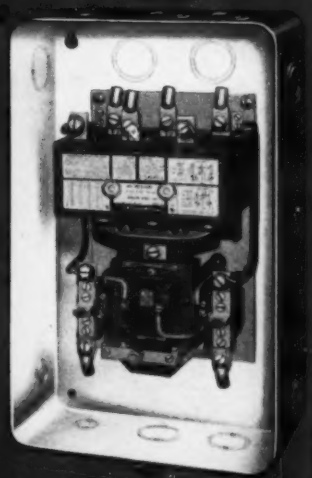
A recommendation was made for key-lock receptacles but it was turned down. The pilfering was finally stopped by cutting the rack circuits from the regular lighting panel and tying them in with the 220/440-volt panel carrying the small auxiliary motors.

With 220-volt lamps in the sockets, the incentive to use them for home lighting was removed. The higher voltage lamps were found soon to have as long a life in their place as other similar yard lights.



"Sure, Mama can see there's lots of room in that starter!"

You'll find plenty of room for wiring in this Allen-Bradley solenoid starter—room to do a neat job. And the white interior helps you do the job quickly. Yet, the over-all dimensions of the Allen-Bradley solenoid starter are smaller than those of any other starter of equal rating. The reason for this is its compact solenoid mechanism. And, once installed, this Allen-Bradley solenoid starter requires little attention. The double break, silver alloy contacts never need cleaning or filing. They last many times longer than ordinary copper contacts. Specify Allen-Bradley solenoid starters on your next job. You will save time and money on every installation—save trouble in service.



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

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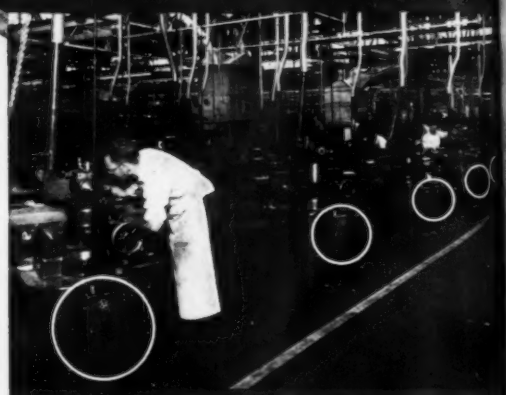
Simplify Your Motor Control Installations this *Easy* Way!

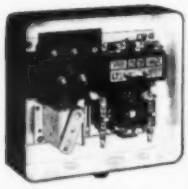


ALLEN-BRADLEY combination starters combine the inherent reliability of the solenoid switch with a disconnect switch of unique design that has the same high current interrupting capacity as the automatic starter. Conduit and wiring connections are greatly simplified—installation cost is reduced. Less mounting space is required than with separate starter and disconnect switch. In addition, the appearance of the installation is greatly improved. The disconnect switch lever is operated from the front of the cabinet. This convenient operating arrangement also permits close grouping of starters. Allen-Bradley combination starters can be furnished with a circuit breaker in place of the disconnect switch.

Allen-Bradley solenoid starters are available for across-the-line, reversing, multi-speed, reduced-voltage, and other types of service. Investigate the Allen-Bradley line—it offers you every advantage.

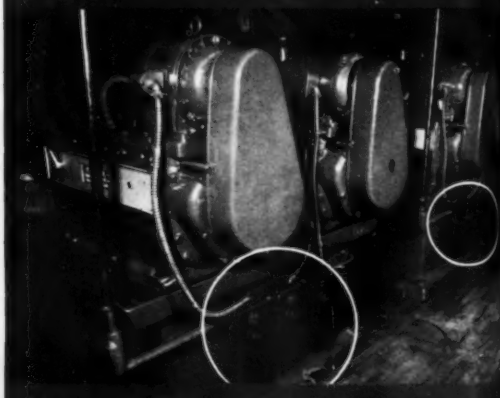
BULLETIN 712 COMBINATION STARTERS OFFER THESE FOUR BENEFITS

Small Size
Generous Wiring Room
Trouble-Free Operation
Attractive Appearance



Bulletin 712 Size 2
Horizontal Type

Bulletin 712 Size 1
Vertical Type



Send for Bulletin 712

A-B

Allen-Bradley Co.
1307 S. First St.
Milwaukee, Wis.

Please send copy of Bulletin 712.

Name .....

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ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

How To Get Business

[FROM PAGE 18]

engage in business as electrical contractors. Unfortunately most of these propose to engage as journeyman contractors and are without capital or training or experience in business management. Sometimes this is done to make another customer and sometimes with the mistaken idea that the more contractors there are the more wiring will be sold or that the more competition there is the lower the prices will be. Neither of these objectives are ever attained, because this contractor can't afford to spend any time selling.

In order to live, he must have a contract right away, a contract at any price or under any conditions and the quick way to get it is by being the lowest bidder on the first job that shows up. The price is not really reduced because when this contractor can't pay the manufacturer or wholesaler the credit loss is passed on in the form of higher prices to those who do pay. The existence of several times as many contractors as there is any economic justification for, makes it impossible for any but a few to secure enough volume to permit of efficient operation.

The Overhead Delusion

Some believe that a contractor who operates on a small scale without equipment has a lower overhead than a contractor who is adequately equipped. All of the statistics of our industry go to prove that, within reasonable limits, the larger the volume the lower the overhead rate per dollar of business transacted. A business can be too large to enable it to operate efficiently, with reasonable profit to its owners and with due regard for the public interest. So far as size is concerned, there is a reasonable minimum and a reasonable maximum which should be observed, and what this reasonable minimum and reasonable maximum is, differs in different industries.

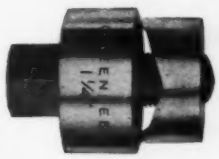
In conclusion, I want to say that in my opinion in order to reduce the cost of electrical installations to the public and at the same time to protect the profits and the capital of the industry, it is the duty of all branches of the electrical industry, including labor, to work together. This will make possible more specialization, more standardization and more creative selling in the electrical contracting industry.

GREENLEE KNOCKOUT TOOLS . . .

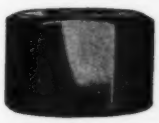
Timesavers for Enlarging Holes in Metal Boxes and Panels

This message is addressed to every contractor who wants to save time in the enlarging of holes for conduit in metal boxes, panels, etc. No longer is it necessary to use makeshift methods, to file or ream. A Greenlee Knockout Punch or Cutter and an ordinary wrench are all that is required. They do the job quickly, easily, leaving a hole that is accurate and smooth. Below are shown the tools available for enlarging holes for conduit from ½ to 3-inch sizes.

Nos. 735 and 737 Knockout Punch Sets

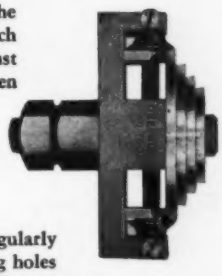


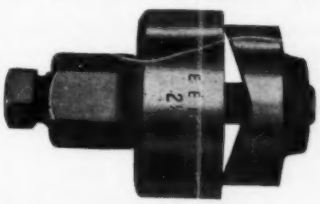
To the right is shown the leather case and one of the punches of the No. 735 Set. This set consists of four punches for enlarging holes for ½, ¾, 1 and 1¼-inch conduit. The No. 737 Set is similar, except that it consists of two punches for 1½ and 2-inch conduit. They will enlarge holes in metal, having a thickness up to ¼-inch, quickly and accurately, eliminating all reaming and filing.



Improved Drive for ½-Inch Punch

Above are illustrated the drive screw and nut which can be furnished to replace the cap screw ordinarily used with the ½-inch punch. The small thread at the end holds the punch while the nut operates on the heavier threaded section against the die. This arrangement adds to the life of the tool when cutting the heavier-gauge metals.





Nos. 738 and 739 Punches

Because of the demand for larger punches, these have been recently added for 2½ and 3-inch conduit. They are packed and sold individually.

No. 740 Knockout Cutter

This tool is regularly equipped for enlarging holes for 1½, 2, 2½ and 3-inch conduit. Odd sizes of holes can also be cut by equipping it with the proper size discs. It is operated by an ordinary wrench, the cutting being done by the two wheel cutters.

• • •

OTHER MONEY-SAVING TOOLS are listed in the attached coupon. Use it to ask for complete data on them as well as on Knockout Tools.

GREENLEE TOOL CO. **Rockford, Illinois**

Use this Coupon and Save Time

GREENLEE TOOL CO., ROCKFORD, ILL.
Please send information on the following tools:

☐ Knockout Tools ☐ Improved Drive for ½" Punch ☐ Conduit Benders ☐ Cable Puller
☐ Joist Borer ☐ Electricians' Bits ☐ Bit Extensions ☐ Radio Chassis Punches ☐ Pipe Pushers

Name ..... Address.....

City ..... State.....

My Jobber is..... E.C. 11-38

UMI

Editorials

Earl Whitehorne, Editor

And Now—Good Times!

By all the signs along the way, there's a clear trail ahead for business. The European war is off for a matter of years, the prophets say. And here at home all barometers are rising. And those who read them agree that for the next nine months—at least—business will be rolling.

Look at the signs. Automobile employment, wages, output and sales are mounting. Steel production is jumping. Car loadings keep swelling. And like it or not—the vast program of Federal spending is just moving ahead and will not reach its peak until April.

And what's this to the electrical contractor? It's everything. The volume of construction in the first half of 1939 is expected to bulk 60 per cent over 1937. It all says the same thing —"Lay fear aside! Make plans! Go get the business."

For Men Only

Pipe and wire is good clean fun. There is quality, honesty, obvious value and strength. We can get our hands on it and treat it rough. It's he-man stuff. We love it.

Light is something else again, ethereal, intangible—and downright sissy. Even a fragile little home service gal from the lighting company can do pretty things with it. To hell with it!—

Ridiculous! And yet, sub-consciously, that infantile reaction is subtly blocking a large number of electrical contractors from doing the job that the industrial and commercial world is begging for, the solving of its lighting problems.

Why? Let's look at our history. Many of us came up from the tools. Socking up a run of 3½ with a pair of 36's was our glory. We looked with ill-concealed contempt upon the fixture man hanging little brackets and the telephone man mumbling over intricate circuits.

But it takes guts, skill, imagination, vision and a sense of the romance to sell modern lighting to industry and we have all these qualities in abundance in this electrical contracting game. All we need is effective direction into the lighting field.

What, then, are we waiting for? Is our thinking to be forever dominated by the cable grip and the hickey? Are we to become merely muscle men on the jobs springing from the agility of other minds? Think! Every lighting job sold *creates* a wiring job. Brother, it's your move!

A Nose Count of Code Makers

Every industry group makes broad gestures about safeguarding the public's interest in our ever-changing National Electrical Code. But who are all these safeguarders? Where do they stand as public representatives?

The electrical inspector ranks foremost as a guardian of public safety against fire hazards, from devices and equipment. That's his only business. The contractor, having his whole reputation at stake, might be expected to take his place on an equal footing with the inspector as a champion of safe wiring.

But the contracting industry has two members on the Electrical Committee of the National Fire Prevention Association — our code-making body. Out of a total membership of 51, representing 24 organizations, the power company, manufacturing, inspection, and stock fire insurance inspectors groups have each seven members. Gadsooks! And how come? It involves the same principle that popped the Boston Tea Party.

Secretive Estimating

Despite the commendable work of an ever-expanding NECA Manual of Estimating, blind guesses still prevail on most contracting work. Sometimes by those who possess this very manual. There is need for much education. Too many people consider their own knowledge of labor units a grand secret. To pass on specialized units for broader use by others is held to be out of reason.

There is enough fine cost data sprinkled among the estimators and contractors of this industry to dispel most of this rule-of-thumb foolishness. Why doesn't everybody use it? It would help toward a better era of fair bidding practice from which substantial operators would gain in overflowing measure.

Fuses—Let's Make it Easy

Next to incandescent lamps, perhaps the most common over-the-counter device in our bag of tricks is the humble fuse. It has gained importance lately in all eyes by the effort to raise fuses to a state of non-tamperability. But just when every electrical man was full of hope and the public was noticing, something went wrong somewhere. Their listing was recently withdrawn by Underwriters' Laboratories. It was found that the non-tamperable features wouldn't stand the prescribed tests.

It is to be hoped that the rival groups of fuse designers will get their heads together. What we want is the best possible protection against the pennied-fuse evil. But we don't want to confuse the general public with a lot of rival gadgets that lack interchangeability. The public understands fuse plugs. It understands attachment plugs largely because they are all alike. Let's give them a standard non-tamperable that they can recognize. Let's stop the common penny evil and we have stopped 95 percent of our fuse abuse. But let's be smart and make it easy for the customer.

Unearned Discounts

To men who believe in fair play, Ralph Walker's statement in Detroit, about the Federal Trade Commission is intriguing. He said, before NECA,

that evidence had been gathered involving a hundred contractors scattered through 28 states and all the manufacturers of wire, cable and conduit. It involves widespread granting of wholesale discounts to men who do not perform the function.

The industry eagerly awaits the further development of this situation and will welcome action by the Government. For men who buy as contractors cannot compete with men who wangle an underhanded extra discount to enable them to undercut their price.

Contractors, who also operate a separate wholesale business, are naturally not involved in this criticism. But unearned functional discounts are evil and absurd, and every branch of the electrical industry should fight them. And it should not be necessary for Washington to clean up our yard.

They've Seen Both Sides

Hairy knights of yore once fought gory battles over a gold and silver shield. But they wore down, became reasonable and found out the shield was gold on one side, silver on the other. It all came out OK.

Inspectors, meeting in their recent sectional conventions, have been listening to A/W speakers. They saw only one thing—does A/W comply with the Code and with local ordinances? Before they were cleared up on this point, Adequate Wiring didn't spark their imagination. Perhaps A/W workers, too, had failed to realize the powerful promotional influence the inspectors can exert.

They have seen both sides. Nothing but good can result from now on. It is important news that spells the speeding up of this activity.

Explain the Difference

The contractor selling farm wiring cannot hope to meet silly prices of local handy men. He must sell on a quality basis. "But why should I pay more?" asks Mr. Customer.

A successful farm wiring contractor in Ohio says "Break down the difference".

Say our price is $120 and the local farm hand quotes $100. For $20 more we supply first of all, high quality materials which are certainly worth more—say $5. Next, the workmanship of experienced men is worth at least $5 more than that of an amateur. Then our guarantee is worth more than $5 in any county. Finally our job is done in the shortest possible time when the customer wants it, at the least inconvenience by responsible men. This service is obviously cheap at $5. We thus qualify the $20 difference. We prove the customer that he gets a bargain and in terms he can understand. It would be easier to say "Well, we do a better job" but that fails to tell the customer what a better job means.

Shavers in Distress

Over 3,000,000 electric razors are now engaged in beard destruction. A big fall and Christmas campaign will boost this total some more. What about outlets for shavers?

A widely traveled convert to electric shaving recently reported his personal observations in a flock of good hotels. He couldn't scrape his chin the electrical way in nine out of ten hotel bathrooms without unscrewing the mirror bulb. In the room itself he had to go into the furniture moving business to find a plug-in, then "squat and squint" to clip the stubble.

But the Pullmans now have razor outlets. Push the button and your porter brings a magic box that converts 32 volts d.c. to pulsating, 115-volt razor current. So electrical contractors had better see their hotel customers and shame them a bit. Or some travelers may start sleeping in Pullmans.

Back Talk

The Courtesy Evil

To the Editor—The "Courtesy Discount" evil, so easily worked through purchasing agents of industrial concerns has become a serious matter for the contractor dealer. For reasons best known to the electrical jobber, it began by first being offered to the Boss and the P. A. It now is extended to the fifth cousin of the little girl, who has a friend, that knows a girl, who is employed in the Vinegar Works down by the river.

George F. Schuck,
Schuck Electric Company,
Philadelphia, Pa.

Joe Fowler of Memphis, launched a crusade against this vicious practice. He damned the practice of giving away merchandise with an appliance purchase. Joe predicted that eventually a pair of pants would be given free with every purchase of a pair of suspenders. In cities where strong leagues are set up, the associated dealers have obtained some relief through appealing to local Merchants Associations and the purchasing agent group. But more needs to be done. You have raised an interesting and timely point.

Building a Real Team

To the Editor—Your fine article "Build A Ball Team" hits right down my alley so-to-speak, in that I spent eight years grooming youngsters into material for football, basketball and baseball teams. From this experience has been learned that all youngsters *cannot* play on a team and that all youngsters *will not* play on a team. Therefore, teams had to be made from the material of those who *could* and *would* play. The situation is identical to that of building an "electrical contractors team."

In organizing and building the North Carolina Association of Electrical Contractors, beginning back in May 1936, the same theory and principle has been used as in building a football, basketball or baseball team. It is working. The same principle of selection and ejection of players for the team has been carried through as would be carried out in the forming of a ball team. We therefore have been just one jump ahead of your article down here in North Carolina.

C. S. Boger,
Charlotte, N. C.

This is good news for we believe it can be done. We believe it must be done if progress is to come out of cooperation. The North Carolina story should be told. Thanks for your letter.

That's Our Hope

To the Editor—I cannot somehow pass up the opportunity to write you a letter expressing great personal interest in the series of editorials that you have been writing in ELECTRICAL CONTRACTING.

Never to my knowledge has anyone taken such a strong and forceful method to awaken the contractor to his responsibilities and opportunities as you have in your recent editorials and I am hopeful that much good will result therefrom.

H. L. Everest, Sales Manager,
Arrow-Hart & Hegeman Electric Co.,
Hartford.

Mr. Everest, you are too generous. But nevertheless it helps. For if you feel that way perhaps we may be doing some good. And that's all there is in it.

Please Pardon Our Modesty

There is an annual contest in the business paper field. The publication *Industrial Marketing* makes an award for which the papers of all industries compete. Ninety six papers entered this time—one contest for "the best series of articles or editorials published in the past year."

Three recognitions were given. One came to Electrical Contracting for a series of editorials and articles directed to the awakening of the electrical construction industry to the importance of adequately rewiring the buildings of America.

We blushed and tittered and said "Thank you very much!"

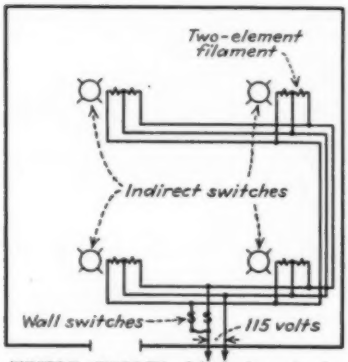
UMI

WIRING Methods

CONTROL FOR THREE-LEVEL LIGHTING

In re-lighting offices, the raceway system usually lends itself to adding a third wire and another wall switch, thus making provisions for convenient control of three-intensity general illumination. A typical office is shown wherein four new indirect lighting units are controlled from two switches near the entrance.

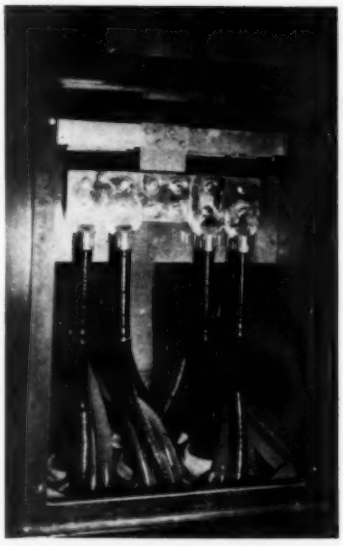
One switch controls the "low" side of all the two-element lamps. When the other switch is closed, the higher wattage filaments are used to provide medium lighting intensity. But when both switches are closed, full intensity is available. This arrangement provides a convenient and orderly choice of illumination levels to meet the variations of daylight that occur during the usual office day.



TRIPLE CHOICE of light intensity for office requires two switches and three conductors.

COMPACT CABLE GROUPING

Shaping up thirty-two 500,000 c.m. cables, routed in eight 4½-in. underfloor conduits to the rear of this main switchboard, tested the skill and brawn of McCleary-Harmon Company electrical workers. The view is at the new Edison Institute of Technology building in Dearborn, Mich.



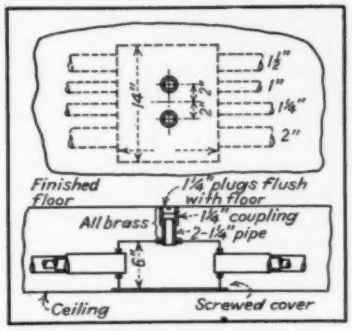
SILVER CONTACTS—Multipled main feeders employ silver-plated lugs and busses for long-time contact assurance.

Solder lugs of the two-bolt type were used, and were bolted back-to-back to ¼ by 4-in. copper buss members. To insure good contact in the years to come, the lugs and rear-of-board busses were silver plated.

FLUSH-IN-FLOOR STUBS FOR LARGE CONDUITS

In wiring the Ohio Edison Company service building at Youngstown, flush floor connections for conduits were required to take care of future meter testing boards. The room layout indicated future locations for six boards in a row, spaced on 9-ft. centers. Four conduits were shown extending in the concrete floor slab beneath these test boards and provisions were to be made for stubbing up at each board with two 1¼-in. conduits.

The installation, as made by the Carlson Electric Company, consisted of screw-cover junction boxes at each stub location. These box covers were made accessible from the ceiling below. Two 1¼-in. nipples were set in place with couplings spaced flush with the finished floor. Brass plugs in these couplings seal the flush stubbed connections until meter testing boards are actually installed.



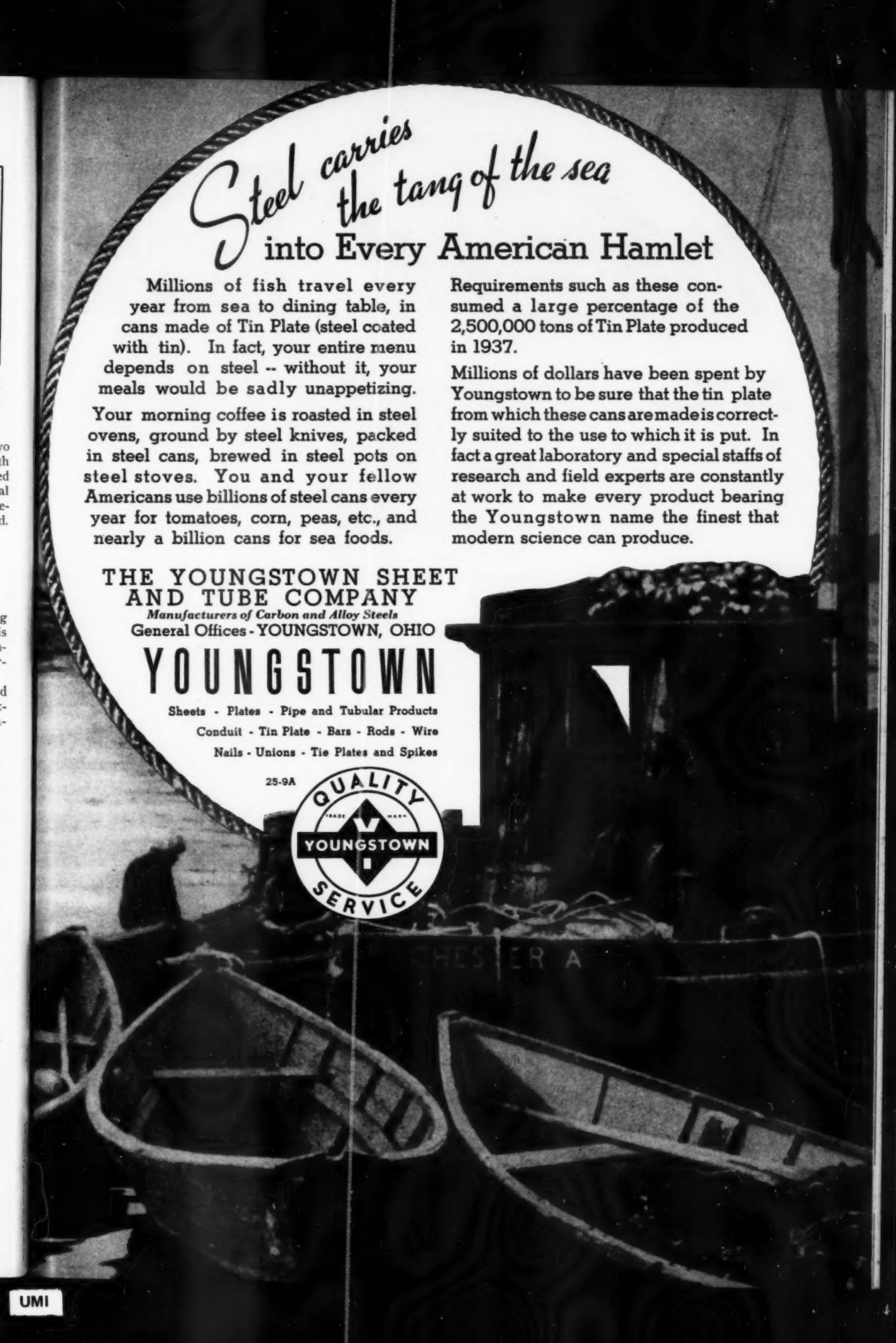
FLOOR JUNCTION—Boxes in concrete slab, for connections to future test boards, have covers accessible on ceiling below.

TEST FOR ASSEMBLED FIXTURES

To avoid expensive trouble shooting for insulation failure after the job is completed, the Romanoff Electric Company makes regular resistance tests during installation.

The most common point of failure and the most difficult to locate is in the fixture assemblies. On the Toledo Vocational School job, all fixtures were made up at an assembly bench ready for hanging. Before distribution through the building each unit was checked with a battery operated megohmmeter. The cost of this test for all the fixtures in the building is less than the cost of one job of trouble shooting on the completed installation.

TESTING fixtures before hanging saves trouble shooting later.


Steel carries the tang of the sea
into Every American Hamlet
Millions of fish travel every year from sea to dining table, in cans made of Tin Plate (steel coated with tin). In fact, your entire menu depends on steel -- without it, your meals would be sadly unappetizing.
Your morning coffee is roasted in steel ovens, ground by steel knives, packed in steel cans, brewed in steel pots on steel stoves. You and your fellow Americans use billions of steel cans every year for tomatoes, corn, peas, etc., and nearly a billion cans for sea foods.
Requirements such as these consumed a large percentage of the 2,500,000 tons of Tin Plate produced in 1937.
Millions of dollars have been spent by Youngstown to be sure that the tin plate from which these cans are made is correctly suited to the use to which it is put. In fact a great laboratory and special staffs of research and field experts are constantly at work to make every product bearing the Youngstown name the finest that modern science can produce.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO
YOUNGSTOWN
Sheets - Plates - Pipe and Tubular Products
Conduit - Tin Plate - Bars - Rods - Wire
Nails - Unions - Tie Plates and Spikes
25-9A
QUALITY
YOUNGSTOWN
SERVICE

UMI

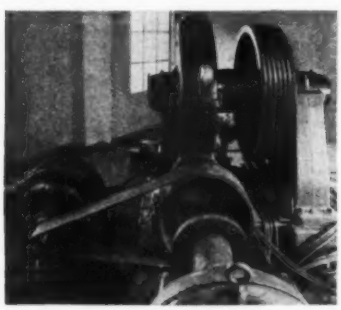
Motor Shops

DIPPING LEEWAY—Two kinds of varnish kept in vats for variety of coil and armature repair jobs.

SERVICE SHOP GOES ON LOCATION

When the traction sheave on a 10-ton freight elevator in a Brooklyn factory needed re-grooving, the machine shop experts of The Maintenance Company, Inc., of New York went there "on location". Portable machinery equipment was brought on the job by Mainco motor service shop workers, and re-grooving was done in the penthouse. Those who are familiar with heavy freight elevators can well appreciate how much heavy lifting and transporting was thus avoided.

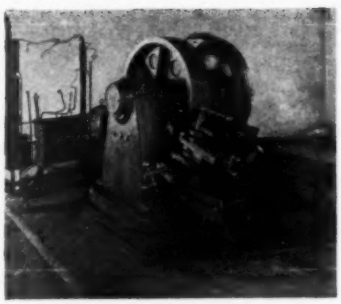
Compound, tool post, and motor drive were set up, mounted on adjustable rests. The sheave, turning on its bearings acted as its own "lathe". In order to reduce the speed of the rotating sheave to proper tool speed, the machine brake was removed and a motor with small pulley was belted to the brake wheel.



PENTHOUSE LATHE — Temporary motor rotates elevator cable sheave for novel regrooving "on location."

In the traction type of elevator the cables pass over and partly around a traction sheave or drum. Each cable runs in a groove which is generally of "V" shape or what is known as step or undercut "U".

On account of the small seating surface and heavy loads on cables, the grooves become worn so that they do not have proper tractive or gripping effect on the cables. It then is necessary to reform the grooves if there is sufficient stock in the sheave, or renew the sheave.



PORTABLE GROOVER — Heavy sheaves left in place and re-grooved with this portable machine-shop outfit.

Where conditions are such that the traction sheave unit can be readily removed, it is Mainco practice to bring the whole unit to the shop. If conditions or size of unit make this impractical, the work is done on the premises.

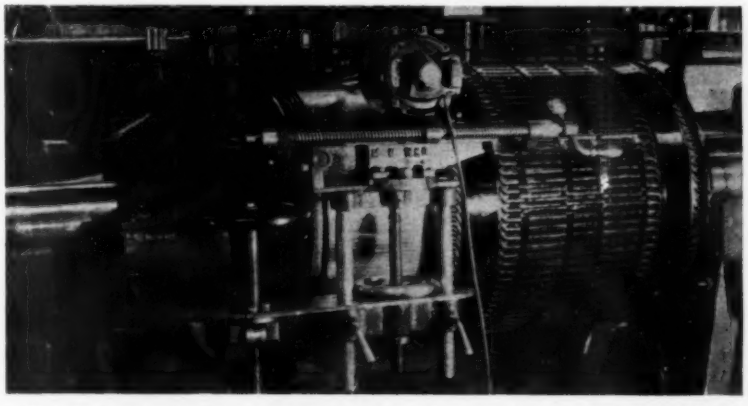
DUAL DIPPING TANKS

The variety of repair service jobs handled by the I. R. Nelson Co., Inc., of Newark, N. J., justified the installation of duplicate varnish dipping vats. One contains 16-hr. black baking varnish, the other 6/8-hr. air-dry varnish for rush jobs. The air-dry varnish is also used as a binder to hold group coils in alignment while being formed on the spreader.

Each vat holds 35 to 40 gallons of varnish in the 36-in. by 14-in. tank space, located below the drain ledge that slopes upward toward the rear of the vat. Made of welded steel with close-fitting hinged covers, these vats are 36 in. wide, 39 in. high over all, and 36 from front to rear.

SHAFT-CLAMPED UNDERCUTTER

The Mielke Electric Works, Inc. of Duluth, Minn. uses a portable undercutting outfit which is clamped to an armature shaft while the armature rests on its shop dolly. Four principle adjusting points are provided; a hand-feed for the cutter motor's slot travel, a hand wheel for raising or lowering the motor bed plate, and another hand wheel that is attached to a heavy threaded floor-rest rod. The outfit is clamped to the armature shaft by means of pressure and alignment shoes that were formed of welded steel plates. Clamping pressure is easily set just tight enough to permit the armature to be rotated for aligning the next commutator slot with the cutter.



CLAMPS ON—Commutator winder cutting is done at the armature dolly with this clamped-on outfit.

ARROW

One-Piece
PORCELAIN
RECEPTACLES

ALL ONE PIECE of glistening white porcelain, sturdily and attractively designed. Built-in mechanism is simple and durable; saves bother of removing the "works" for wiring. Bindings screws have large heads for easy connections. Convenience outlet is *internally* connected . . . Large size for 4″ boxes, small size for $3\frac{1}{4}$″ boxes—both available with *or* without convenience outlet. Rating: Pull mechanism, 250 Watts, 250 Volts. Outlets: 15 Amps., 125 V., 10 Amps., 250 V. Outlets equipped with short chain, chain with insulator or chain and cord. Ask for catalog data-sheet carrying *complete* listings.

SOLD THROUGH YOUR ELECTRICAL WHOLESALER

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

UMI

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Sectional Enclosed Panels

Q. *"In the 1935 Code the second sentence of section 512p reads: 'Sections of cabinets and cutout boxes completely separated by unpierced barriers of non-combustible material shall be considered as separate cabinets or boxes'. I cannot find this sentence in the 1937 Code. Does this mean that we can now put holes in the barriers separating the sections of a cabinet and run the wires between sections?"* —P.H.C.

A. No! The changes made to this particular subject mean that sectional cabinets are no longer permitted (unless the sum of all of the circuits in all of the sections does not exceed forty-two.)

In the 1935 Code these matters were covered in sections 512p and 1303h. Section 512p covered the wires in a panelboard, and section 1303 covered the number of cutouts allowed in a panel.

The 1937 Code revision resulted in deletions which prohibit the use of sectionalized panelboards, and require that for each 42 circuits (or less) a separate panelboard be in an entirely separate cabinet.

These requirements eliminate some of the massing of wires and fuses with the resulting bad heating effects, and also effect a greater dissipation of heat through the sides of the cabinets. With the sectional panels the heat of one section would affect the heating of the adjoining sections.

Cutout Bases

Q. *"Is it permissible to use the old style fuse cutouts that will take any size fuse, or must adapters be put in so they cannot be overfused? What is to be done in jobs already done, where owner or tenant uses 30 amp. fuses in every block?*—B.F.R."

A. The 1935 Code set up a date for the mandatory use of non-tamperable fuses, to become a requirement, but under the 1937 Code the "old style" fuse cutouts may be used. This permits the continued use of 30 amp. plug fuses in every block.

Only local legislation will, at this time, prevent this.

The use of non-temperable fuses is permissible. Where an owner desires to prevent overfusing by a tenant he can use the non-tamperable cutouts, or make the "old style" blocks non-tamperable by inserting adaptors.

It is hoped that the public at large will eventually be educated to the hazards of monkeying with the "safety-valve."

CIRCUIT RIDERS—*The five sectional meetings held each fall by IAEI imposed heavy mileage and many weeks from closed desks upon H. N. Pye, IAEI's international president, and Victor H. Tousley, secretary. Here we see them during the Cleveland meeting.*

Three No. 8 Wires in ¾-Inch Conduit

Q. *"Table 2, Chapter 9, N. E. C., Number of Conductors in Conduit, states that no more than two No. 8 conductors can be placed in ¾-inch conduit. Assuming that this takes precedence over Table 5, which would permit three No. 8's, the question arises as to the reason for such a differential. My calculations in regard to Table 5 are:*

43% (Table 5) of .53 sq.in. (table 8) = .228 sq.in. permitted occupied area.

3 × .071 (table 6) = .213 sq.in. calculated occupied area.

Why, therefore is it not permissible to install three No. 8 wires in ¾ in. conduit?—R. G. S.

A. Table 2 of Chapter 9 of the Code which covers the size of conduit to be used for three No. 8 wires is to be given precedence. Under the heading of Table 5, it is stated that Table 5 is a recommendation "for groups or combinations of conductors *not included* in Table (s) 2,***". National Electrical Codes prior to the 1931 issue required 1-in. conduit for three No. 8 wires. The 1931 Code permitted ¾-in. conduit for three No. 8 wires. These changes were no doubt made due to the change from double braided wire to single braided.

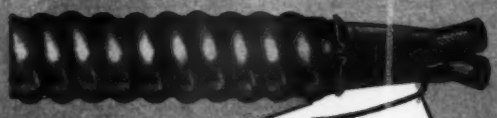
Then in the 1935 Code the requirement was changed from the ¾-in. back to the 1-in. conduit for three No. 8 wires. There were two reasons back of this change. First, the thickness of insulation on the wire was increased from 3/64 in. to 4/64 in., which naturally would make a difference with the fill of the conduit; and, second, there were serious complaints from the field. In attempting to pull three No. 8 wires into ¾ in. conduit, considerable damage was being done to the insulation. A technical sub-committee of the Article 5 committee furnished a very comprehensive report to the Electrical Committee, which resulted in numerous changes being made to the tables discussed.

The calculations given in your question are correct, but the requirements in Table 2 are to be followed to prevent damage to the wires. There will probably be more places in Table 2 where calculations according to Table 5 will not give the numbers of conductors found in Table 2. But while such calculations may provide a few hours pastime, they are entirely unproductive, as Table 2 is to be used for the combinations given, and Table 5 must be used where the combinations in hand are not to be found in Table 2.

HAZARD

ARMORED CABLES

A Complete Line — Proven High Quality



HAZARD ARMORED CABLE, Type AC

has a flame-resisting, moisture-proof paper sheath between the conductors and spiral interlocked steel armor. A ripcord beneath the paper facilitates installation. An insulating bushing is inserted at the cut ends over the paper sheath.

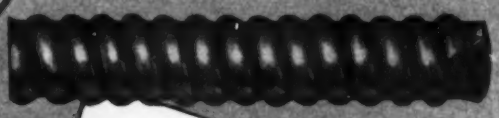
HAZARD ARMORED THERMOSTAT CABLE

has heat-resisting rubber insulation on each conductor, colored for identification, and armored for mechanical protection. Insures positive operation of control apparatus for heating and air-conditioning systems.

ADEQUATE WIRING SERVES AND SAVES

HAZARD ARMORED GROUND WIRE

with tinned copper conductor without insulation, armored for protection. The armor makes grounding assurance doubly sure.



HAZARD FLEXIBLE STEEL CONDUIT

is offered as a single unit. This strong but flexible conduit saves time and expense for short runs or where many bends must be made.

HAZARD INSULATED WIRE WORKS

DIVISION OF THE ANACONDA COPPER MINING CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit

Seattle Dallas Washington San Francisco St. Louis Los Angeles

UMI

GEORGE THOMAS GETS McGRAW AWARD

George C. Thomas, Jr., vice-president and treasurer of Thomas & Betts Co., of Elizabeth, N. J., received the James H. McGraw Award Manufacturer's Medal at the NEMA Convention in Chicago, Oct. 27. The award was in recognition of his contribution in marshaling the support of a united industry behind the promotion of adequate wiring and launching the National Adequate Wiring Bureau.

MEDALIST—George C. Thomas, Jr.

The presentation was made by H. B. Crouse, president of Crouse-Hinds Company, a member of the Committee of Awards. The committee of judges, appointed by NEMA to select the medalist, was C. E. Swartzbaugh, C. L. Peirce, Jr., H. B. Crouse and Frank Thornton, Jr.

The following citation was given—

"George C. Thomas, Jr., vice-president and treasurer of The Thomas & Betts Co. of Elizabeth, New Jersey, because of his long background on the problems of electrical construction, was selected by the National Electrical Manufacturers Association to make a study of the possibilities for a cooperative industry development of the market for more adequate wiring and to secure the support of the other branches of the electrical industry for such a program. Though this project was a major feature of the NEMA Business Development Committee Plan, it offered many obstacles, because of the conflict between the natural interests of the several branches of the electrical industry and contrast in their angles of approach. Mr. Thomas set to work to explore these differences of opinion, and to marshal those elements of common interest around which joint action for mutual benefit might be organized.

By his knowledge of the technicalities of the wiring field, his understanding of the preferences and prejudices of contractors, wholesalers, power companies and manufacturers, his patience in reconciling the divergent factors of the problem and the fine example of his personal generosity in devoting his time and energies to promote the progress of the industry broadly, he succeeded in winning the allegiance of all interests to a common objective and effecting an eager coordination. This purpose was crystallized in the establishment of the National Adequate Wiring Bureau, which has since organized a cooperative campaign to extend the facilities enjoyed by the American public in the use of electricity and thereby to expand the market for wiring materials, electrical appliances, equipment and apparatus.

NECA COMMITTEE ON REA WORK

The following NECA members have been appointed by President Peak to serve with him as an advisory committee on line construction and farm wiring matters relating to the REA: R. C. Bigby, Tampa; Paul L. Gilmore, Columbus; M. E. Hart, New Orleans; N. P. Hoisington, Philadelphia; W. E. Mielly, Evanston, Ill.; A. S. Schulman and R. J. Stretch, Chicago; and F. E. Surrell, Detroit.

The committee will exchange information on developments in rural electrification in their respective sections of the country. This will be done with a view toward working out problems of REA in which electrical contractors are vitally concerned. The committee is to function in accordance with a resolution adopted at the Detroit convention.

INSPECTORS ENDORSE ADEQUATE WIRING

The 12th annual meeting of the Northwestern Section, I.A.E.I., held at Spokane, Wash., Oct. 3-5 took time out from Code matters, to endorse the program of the National Adequate Wiring Bureau. They also requested the removal from the Code of the term "by special permission of the enforcing authority," to make it definite and specific in all cases. The value of public education regarding the Code as a safety factor in the use of electricity was emphasized.

The convention attracted the largest registration in its history. Many attending were electrical contractors who work on

1000TH RED SEAL STORE—Toronto's success with adequate wiring promotion goes beyond the scope of homes. Here is Number 1000 in its list of stores that have been wired in compliance with Electric Service League store specifications. Red Seal homes were up to 26,150 when last reports came in from Toronto.

TRUMBULL

Control

"T.M." *line* . . MANUAL MOTOR STARTERS . . "T.T." *line*

When you're looking for compact, attractively designed and thoroughly dependable manual starters for small motors you'll need to go no further than these three well-known Trumbull Lines. For the smallest class of motor driven shop, office and home equipment select Type "TT" (Thermostatic Tumbler). For motors up to 2 H.P. select "TM 2," in compact rounded corner boxes with front tumbler switch operation. And for motors up to 7½ H.P., select "TM 7½" with either front tumbler switch operation or regular side switch handle.

Either one of these fine manual starters will assure you full, accurate and dependable motor protection against overload. Interchangeable relay heaters provide correct ampere ratings for every installation. There are no parts to be replaced when the starter trips . . . no complicated parts needing maintenance. All three starters will stand heavy starting load but will always trip on overload before damage occurs. Every provision has been made for easy installation, wiring and changing of heater units.

You'll find, too, in every detail of the construction of these starters the hall mark of Trumbull quality in design and workmanship. A Bakelite case encloses the entire Type "TT" mechanism, for example. Types "TM 2" and "TM 7½" feature the same type of duo-break contacts as on Trumbull Magnetic Starters, eliminating burning of contacts and assuring a positive make and break. Single moulded base of the entire starter mechanism is saddle mounted for ease in wiring. All live parts are visible and removable from the front, with straight through wiring. Available in forms for flush and "built-in" mountings and in cast iron boxes ("TM 7½" only). Group fusing heaters are also available for special applications.

Trumbull Manual Starters will be further illustrated and described in the November issue of Trumbull "Cheer" . . . the interesting monthly that now goes to 38,000 electrical men. We shall be glad to send you a copy and place your name on this list.

The TRUMBULL ELECTRIC MFG. CO.

PLAINVILLE — CONNECTICUT

UMI

[FROM PAGE 64]

association committees during the year along with the active inspectors. Chester M. Kirsop, chief electrical inspector of Olympia, Wash., was elected president for the coming year. Blaine Grey, Salt Lake City, Utah, and H. C. Swann, Spokane, were elected vice-presidents and F. D. Weber of Portland, was re-elected secretary-treasurer. L. W. Going and Mr. Weber were given positions on the Executive Council, I.A.E.I., and were elected to represent the Northwestern Section on the Electrical Committee, N.F.P.A.

COAST INSPECTORS HAVE BROAD PROGRAM

Pacific Coast members of the Southwestern Section, I.A.E.I. met October 10-12 at Long Beach, Calif., and focused on three major topics. They were E.E.I.'s proposals for changes to the next Code, the NEMA research reports covering current carrying capacity of wires, and local programs for promoting adequate wiring, featured. In addition, there were important papers on the economic effect of voltage drop as related to the classification of circuits, power factor correction, explosion-proof wiring and other current inspector problems. Two educational films were shown as well.

Outstanding results of this meeting were —Decision to reserve judgment on the EEI Code proposals pending further general study, to weigh the general need for more feeder copper, in view of NEMA's wire research, and to further the progress of adequate wiring promotion. The voltage drop discussions raised the question of how far legislation should go toward controlling system design features which are not related to safety, to life or property.

The new officers for the section are W. J. Tretheway, president, J. I. Dixon, first vice-president, Otis Newcomb, second vice-president and Harold Gerber, secretary and treasurer. G. E. Price was elected to the executive council.

IBEW SIGNS NEW YORK INDUSTRIAL SHOPS

Most of the important industrial contractors in greater New York have recently agreed to employ members of the International Brotherhood of Electrical Workers. It is the outcome of lengthy negotiations which write a new chapter in the annals of New York labor agreements. The larger open-shop operators agreed to unionize their men, IBEW granted a split scale that makes possible the employment of union men for factory work, and several important new points in employer union relations were introduced.

Under the new order an agreement was adopted that places employers and electrical workers in "A" and "I" classes of work. Those in the "A" classification continue under a $2 scale. The "A" group is to engage in all new construction (excepting new one or two family houses), all city, state, Federal and public utility work, and those operations where other building trade operations are carried on and which are normally carried out by "A" members of the Union. The "I" class of work bears a journeyman scale of $1.12½ per hour and covers residences and commercial and industrial installations outside the scope of "A" jurisdiction.

The leading factor in adopting this large-scale unionization agreement was the Greater City Electrical Contractors Association, Inc. This organization has existed for several years and is said to do about 75 per cent of New York's "open shop" work. About 100 Greater City members, however, are now operating under an agreement with Local Union No. 3, dated August 15, 1938. Another 150 employers, scattered among four separate associations in the New York boroughs, have also signed up. This is said to have added over 1500 former non-union workers to the IBEW ranks. There are some 300 "A" contractors who were formerly the sole union contracting employers.

CHIEF HONORED by his staff. A. T. Babbitt, Chief Inspector of the Michigan Electrical Administrative Board proudly displays a watch given to him by his staff of electrical inspectors. This token of esteem was presented at the annual meeting of the Western Section, International Association of Electrical Inspectors in Cleveland.

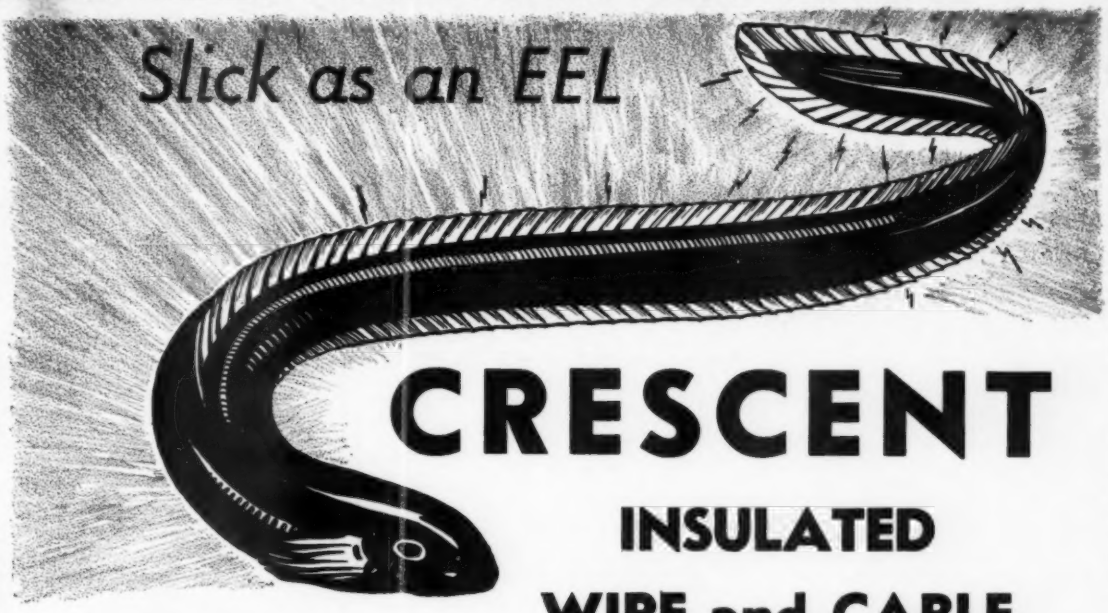
"Alright, Sir Raleigh, none of your high-powered gallantry!"

LABORATORIES WITHDRAW FUSE LISTINGS

Tests recently conducted by Underwriters' Laboratories, Inc., to determine the non-tamperable features of plug fuses and adapters, showed failure under the proposed requirements established for such devices. As a result the listings for non-tamperable plug fuses and adapters were withdrawn during August. Revised listings, appearing in the September Electrical Bulletin of the Laboratories, name four manufacturers under the heading "Special Fuses" whose products are indicated as showing acceptable performance for over-current and short-circuit protection. No mention of non-tamperability is made under these "Label Service" listings, but these devices are described as being "For use in adapters in Edison base fuseholders or in special fuseholders."

The non-tamperable plug fuse situation dates back to a public hearing held at

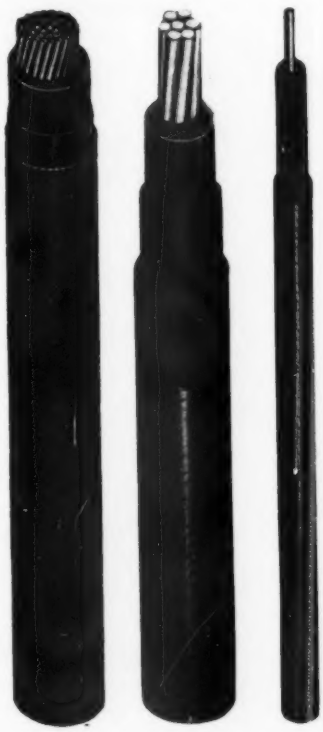
VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE



CRESCENT

INSULATED WIRE and CABLE

By the way, the eel pictured here is also in the electrical business. It is the Electric Eel of South America, able to produce 330 volts generated in 240 cells of its body.



That's as good a comparison as we can draw when it comes to the easy fishing quality of Crescent Wire. In fact, it's the Crescent "Slick Finish" on the flame-retarding, moisture-resisting braid that relieves stress on insulation and conductors alike when pulling the wires through conduits. A smooth, hard, yet slick finish results which prevents adherence to other wires or the sides of the conduits.

Thus its ease of installation reduces labor costs and insures long life—which contribute to the unanimous opinion of all who sell and install it that CRESCENT INSULATED WIRE AND CABLE is a profitable line to handle.

CRESCENT
INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY.

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER PROOF WIRE

GOSH— how easy!

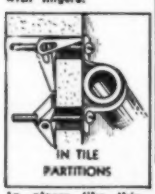
BUT— *BE SURE* to use the ORIGINAL SPRING PAINE WING TOGGLE BOLT

It certainly is a simple matter to get a secure, PERMANENT anchorage in any hollow or hollow-backed material when you use PAINE TOGGLE BOLTS. Merely slip the toggle head through the drilled hole. The instant the toggle wings clear the hole, they snap open to anchoring position. Then tighten the toggle nut or bolt head and the job is done once and for all.

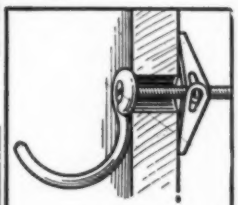
—no trick at all!

Just slip the toggle through the drilled hole . . . no need to compress the wings with fingers.

Architect, Contractor, Builder, Dealer, Jobber or Salesman—whichever you are, you should have the PAINE BOOK on Builders' Anchoring and Hanger Specialties. Send for your free copy.



In places like this, one wing gives secure anchorage.



PAINE Toggle Action is automatic. When the toggle wings clear the hole, pull toggle back towards you and tighten. Easy . . . foolproof

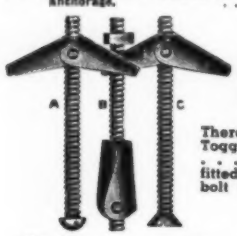


Fig. 123

World's Most Complete Line

There's a PAINE Toggle . . . any size . . . any style . . . fitted with any kind of bolt head or nut.

PAINE
1912 1939
ANCHORS HANGERS
Superior Feature
BUILDERS SPECIALTIES

Maine office and factory:
Dept. 58B—2949 Carroll Ave., CHICAGO
Eastern office: 48 Warren St., NEW YORK

In the News

[FROM PAGE 66]

Underwriters' Laboratories, Ins., on October 8, 1937, when performance requirements for non-tamperability were discussed. Proposed requirements were developed for non-tamperable plug fuses and adapters. These requirements were circularized under date of December 16, 1937. The tests which caused withdrawal of Laboratories' listings were conducted on the basis of the proposed requirements.

Since the original non-tamperable plug fuses and adapters were listed for four manufacturers operating under a reported licensing agreement, another type or line of plug fuse devices has been announced by several cooperating manufacturers.

OHIO CONTRACTORS DISCUSS LICENSE

Legislation for state-wide electrical inspection and contractor's licensing was the main theme of the annual meeting of the Ohio Electrical Contractors Association held in Cincinnati Oct. 19 and 20. L. P. Dendel, chairman of the Michigan Electrical Administrative Committee, outlined the progress of inspection and licensing legislation in that state. It was then reported that the Ohio legislative committee has decided that the model state electrical inspection law as prepared by the Legislative Committee of the National Fire Waste Council would be used as the basis for further activity in promoting Ohio legislation.

F. O. Evertz, chief electrical inspector of the Ohio Inspection Bureau, urged the contractors to do a more effective job in selling safety and adequacy to the public. Deploring price competition, he said, brings about low profits with embarrassing demands upon his Bureau from contractors for special favors in order to reduce cost. The proposals of the Edison Electric Institute for a broad revision of the National Electrical Code were brought before the meeting for discussion and a resolution passed generally opposing these proposals.

Officers elected for the coming year are: P. W. Schath of Cincinnati, President; A. B. Weinfeld, Columbus, First Vice-President; A. S. Koenreich, Canton, Second Vice-President; E. Strasser, Upper Sandusky, Third Vice-President; and C. S. Hammer, Toledo, Secretary-Treasurer.

NISA DEFINES MOTOR DISTRIBUTION

National Industrial Service Association has distributed to its members a statement of trade policy prepared by the Trade Relations Committee. This action was taken by the executive committee at its meeting in Chicago Oct. 23-24. The report defines the conditions under which electric motor and control equipment should be distributed—

SHERMAN

BAKELITE

FIXTURE CONNECTORS

ASSEMBLY

- Make truly safe "Pigtail" joints
- Takes any needed wire combination
- Mechanically strong
- Electrically safe
- Set screw and body of highest quality bakelite
- One size only—large stocks always on hand

Contractors are enthusiastic about Sherman Bakelite Fixture Connectors for all small wire connections—time- and labor-savers. See your wholesaler or send for Trade Bulletin No. 18.

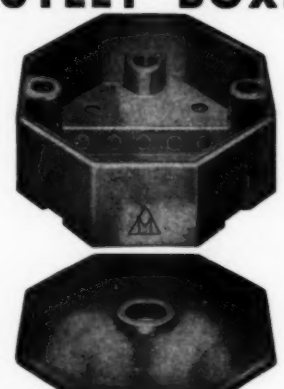
H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

Profit by USING

ILLINOIS

Dependable Porcelain

OUTLET BOXES



★Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

...Announcing A NEW LINE OF COLT-NOARK FUSELESS MAIN SWITCHES

- ★ designed to cut installation costs
- ★ providing extra space for branch circuits
- ★ two cabinet sizes . . . for flush or surface mounting

A new line to boost your switch profits

Cat. No. 32N3, showing short cabinet. At right is Cat. No. 35N6F in long cabinet, with space for Transformer and Despard Switch.

Fuseless Main Switches with up to six branch circuits are now permitted by the National Electrical Code . . . and here is a brand new Colt-Noark line of Fuseless Main Switches that come within these specifications. 30 Ampere, 125-250 Volts, with Solid Neutral. They are typical Colt-Noark units . . . compact, rugged, easily installed, designed to provide maximum safety and long life. Note the features at the right . . . then order your stock and get your share of this new business.

Detailed information is yours for the asking. Also send for a copy of our latest catalog 60-S.

Note these Features

1. Maximum of six branch circuits.
2. Permitted by National Electrical Code and listed by Underwriters' Laboratories.
3. Front operated Rotor Disc switch.
4. With or without provision for both transformer and Despard Type switches.
5. Complete interior units easily removed from cabinets to facilitate wiring.
6. Flush and Surface type cabinets.
7. Plaster adjustments for flush type cabinets.

100 Years of Manufacturing Experience is back of every Colt Built Product

COLT-NOARK

SWITCHES INDUSTRIAL CONTROL EQUIPMENT FUSES

Boston
New York
Chicago
Philadelphia

UMI

So you want to give your customers maximum safety . . .

And Still Make More Money On Every Wiring Job!

Naturally there are two important objectives for every contractor to set for himself . . . and by adopting Knob & Tube wiring methods, they're *both* easy to obtain. Why?

BECAUSE the All-porcelain insulated wiring system is based upon complete separation of the conductors by air: this assures fast dissipation of heat from fully loaded conductors and prolongs the life of the system.

BECAUSE Knob & Tube wiring is essentially a labor proposition, your profit margin is greatly increased. Your electrical wholesaler handles a full line of PORCELAIN PRODUCTS for every requirement of all-porcelain insulated wiring. Write us direct for descriptive literature.

PORCELAIN PRODUCTS, INC.
FINDLAY, OHIO
PARKERSBURG, W. VA.

In the News

[FROM PAGE 68]

Local distributors are divided into two classes—(1) franchised dealers who represent one motor or control manufacturer in the distribution of that manufacturer's product; and (2) brokers, who do not push the sale of any one manufacturer's equipment and are not considered entitled to the full discount of a franchised distributor.

Manufacturers who do not give sufficient margin, or who do not give an exclusive territory, are held entitled only to a brokerage, for service such as any member is free to render to any other manufacturer. The committee recommended that NISA members represent only those manufacturers who adhere to an equitable policy of distribution, who provide a fair contract with an adequate margin to provide for the engineering, sales and servicing costs, and who allow a fair profit on the distribution services rendered.

The report discusses the lines of large prestige manufacturers, which offer easier sales acceptance but also involve smaller margins to the distributor, or provide a more restricted form of franchise than other manufacturers. It is for these reasons it states, that many NISA members represent a so-called non-prestige line, where there is a real sales service to be performed by the franchised distributor for the manufacturer.

The restricted service of brokers or multi-franchise distributors, the report says, leads the manufacturer to arrange for as many broker outlets as possible in a territory, in the hope of catching an additional order. Such distributors, not caring which make of motor they sell, often fight for the business by cutting prices. So a multi-franchise distribution policy leads to intensive direct sales effort by the motor manufacturers, in some cases short-circuiting the distributor, and directing service and repair business to the manufacturer's own service shops.

The committee recommended that its members arrange for the exclusive representation of the best available line which will provide a fair contract with an adequate margin of profit.

NECA DRAFTS BIDDING BILL

A revised bill on bidding practice is being drafted by NECA to be introduced in the next Congress. It will require general contractors, when bidding on Federal work, to name their subcontractors and the material men and supply men whose services they intend to use. A similar bill passed by Congress at the last session had been so amended in its passage through the House that it was unacceptable to the President and was vetoed by him. In announcing his veto, the President stated that he recognized the evil of bid shopping and favored legislation that would curb this evil, but he felt that the bill as passed by Congress would not accomplish that result.

On October 19th a conference was called by NECA in Washington which was attended by the executive managers of the National Electrical Contractors Association, the National Association of Master Plumbers, the Heating, Piping & Air Con-

Do you know YOUR DISCOUNT on SIGNAL DRILLS?

The popular and well-known line of Signal Portable Electric Drills invites comparison for appearance, size, quality, and dependable long life performance in their rated capacities. Contractors prefer the Signal drill because it gives them all they require in a tool of this kind at an unusual saving. Write for complete information today.

SIGNAL ELECTRIC MFG. CO.
Menominee Michigan
Offices in all principal cities

SIGNAL

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

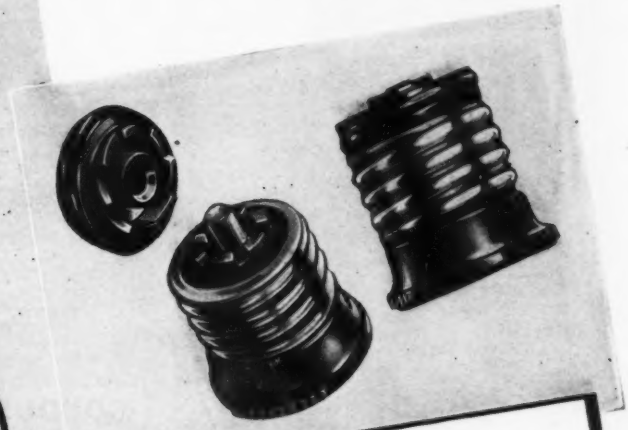
MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

GENERAL ELECTRIC ANNOUNCES

TAMRES

A New Tamper-resisting Fuse

(Listed by Underwriters)



For Further Information

about G-E Tamres Tamper-resisting Fuses see the G-E Merchandise Distributor nearest you or write to Section D-81711, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Connecticut

This new tamper-resisting fuse will protect the wiring you install and assure your customers of receiving all of the benefits that the wiring is designed to give. Tamres Fuses have standard Edison bases and will fit in any existing standard fuseholder or cutout. They can be used with or without the adapter. Without the adapter they are like any ordinary plug fuse, but with the adapter they become tamper-resisting. This flexibility enables you to satisfy all customers from one stock of fuses.

The adapter, which makes Tamres Fuses tamper-resisting, fits on the base of the fuse and screws in with the fuse. When the fuse is removed the adapter remains permanently secured in the cutout ready to receive the same fuse again or a new fuse.

Tamres Fuses are listed by Underwriters' Laboratories, Inc. and meet all requirements for tamper-resisting or non-tamperable fuses. They are made of black Textolite and have large, clear windows. Tamres Plug Fuse, 15 amp—Cat. No. TR15, Tamres Plug Fuse Adapter—Cat. No. TR40.

GENERAL ELECTRIC

UMI

AFTER ALL—

SHAWMUT
SHUR-LAG
RENEWABLE
FUSES

The CHASE-SHAWMUT COMPANY

NEWBURYPORT
MASSACHUSETTS

In the News

[FROM PAGE 70]

ditioning Contractors National Association, the Tile and Mantel Contractors National Association and the Painting and Decorating Contractors of America. These groups discussed the proposed revised bill, also plans for legislation to bring about separation of contracts for the mechanical trades on Federal projects.

ADOPT NEW CONDUIT LABEL

At the recommendation of the Rigid Steel Conduit Association, a new uniform inspection manifest for rigid steel conduit has been designed by Underwriters' Laboratories, Inc. This manifest is intended to assist inspectors in distinguishing listed and labeled rigid steel conduit from water pipe, steam pipe, gas pipe, etc., which is not inspected to insure suitability for electrical use.

The uniform manifest is included as a part of a manufacturer's complete design which may be oval, round, or other shape,

CONDUIT LABEL—New design for rigid steel conduit designed to assist inspectors in checking cheaters.

and the space outside of the manifest will carry the manufacturer's name, address, trademark, etc.

WEST COAST GEARS RED SEAL TO A-W

To clear up confusion as to how Red Seal and Adequate Wiring specifications fit together in the promotion of wiring throughout Southern California, a series of meetings was held during October. The Electrical Development League of Southern California, and the Pacific Coast Electrical Bureau sponsored eight local meetings which were well attended.

Speakers included Victor Hartley, Pacific Coast Electrical Bureau, Howard Douglas and Henry C. Rice of Southern California Edison and Arthur Rowley of Thermador Electric. They gave a boost to the re-wiring movement and demonstrated that the revised Red Seal and Adequate Wiring specifications are now identical.

WIRE PACKAGING SURVEY

A survey has been made to determine the preference of electrical contractors as to the most suitable size package for No. 14 and 12 building wire. This information was obtained by NECA at the request of various wire manufacturers.

Of 102 replies received, 75 per cent reported a preference for both No. 14 and No. 12 wire to be supplied in 500-ft. coils, and in individual packages. A tabulation of the opinions shows that:

	No. 14 wire	*No. 12 wire*
75 pfd.	500 ft. (1 coil)	500 ft. (1 coil)
4 pfd.	1000 ft. (2 coils)	1000 ft. (2 coils)
16 pfd.	2000 ft. (4 coils)	2000 ft. (4 coils)
3 pfd.	2000 ft. (4 coils)	1000 ft. (2 coils)
2 pfd.	2500 ft. (5 coils)	2000 ft. (4 coils)
2 pfd.		1000 ft. (1 coil)

MORE FUNDS FOR FARM WIRING

Recent allotments announced by the Rural Electrification Administration to finance farm wiring and plumbing loans are—

Alabama—$15,000 for customers in 5 counties.

Georgia—$50,000 for customers in 32 counties.

Iowa—$37,000 for customers in 10 counties.

Kansas—$5,000 for customers in Sedgwick County.

Kentucky—$5,000 for customers in 5 counties.

Michigan—$20,000 for customers in 4 counties.

Minnesota—$48,000 for customers in 18 counties.

Nebraska—$25,000 for customers in 5 counties.

Ohio—$5,000 for customers in 4 counties.

Pennsylvania—$16,000 for customers in 4 counties.

Texas—$30,000 for customers in 11 counties.

Wisconsin—$25,000 for customers in 11 counties.

MANUFACTURERS NEWS

F. J. Healey has been appointed general manager of the Lamp Division of the **Hygrade Sylvania Corporation.**

Roller-Smith Company of New York has announced the appointments of J. D. Wood, president, G. L. Crosby, vice-president and general sales manager and W. J. Schuhmann, treasurer.

Tom Carmon has recently joined the selling organization of the George Butler Electric Sales Co. of Chicago, midwestern representative for **Triangle Conduit & Cable Co., Inc.,** of New York. Mr. Carmon is covering the states of Missouri, Kansas and Nebraska, with headquarters at Kansas City, Mo.

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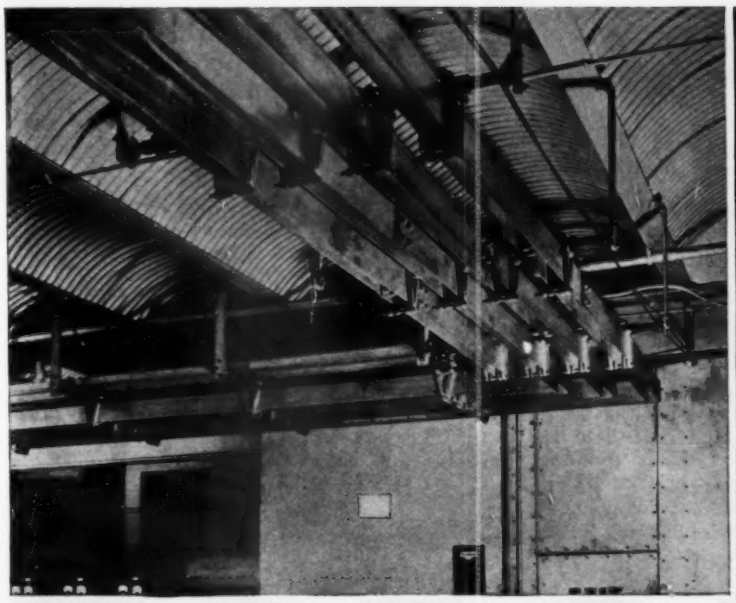

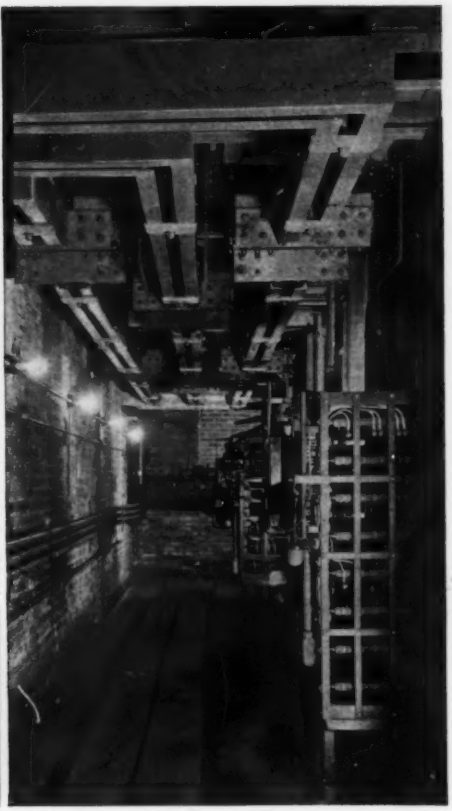

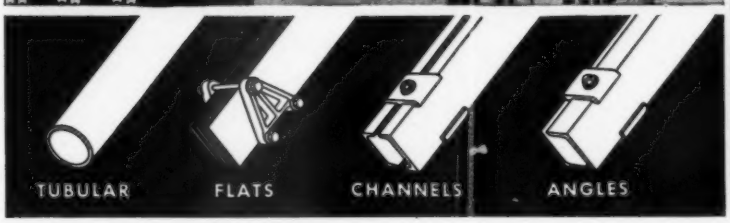

Where electrical loads are heavy, reduce mechanical loads with light weight *Alcoa Aluminum Bus Bar*

Where bus bars must handle heavy loads, Alcoa Aluminum channel bus not only provides the necessary current carrying capacity, but also has the mechanical strength to withstand short-circuit stresses, and the ability to dissipate heat. Because it weighs less than half as much as other materials of similar conductivity, the lay-out is greatly simplified.

With Aluminum bus of any type—flats, tubular, channels or angles—less burden is placed on supporting structures. Supports can be more widely spaced and many economies in design and erection are possible. Standard fittings and construction methods are employed with Aluminum bus bar.

Long life is assured because Aluminum is highly resistant to the corrosive attack of the atmosphere and many chemicals. Our engineers will be pleased to assist in selecting the Alcoa Aluminum bus bar best suited to your needs. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.

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TIME SWITCHES
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1650 Watts
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4000 Watts
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The MARR CONNECTOR
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Make your connections the modern, easy way. No messing with solder— A screwdriver and a twist is all you need with the MARR.

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GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET, NEW YORK, N. Y., U. S. A.

In the News

[FROM PAGE 72]

Paragon Electric Co. of Chicago is enlarging its factory floor space at Manitowoc, Wisconsin, to care for the steady increase in business they have been enjoying this summer. The new addition will be devoted almost entirely to assembly and testing departments.

Trico Fuse Mfg. Co. of Milwaukee, Wis., announces the following appointments:

H. L. Huxster, 1110 Darby Road, Upper Darby, Pa., will be district sales representative in southeastern Pennsylvania and Southern New Jersey.

Marine Specialty & Mill Supply Co., 201 Julia Street, New Orleans, La., will be agent-distributors for the state of Louisiana and southern Mississippi.

Earl S. Condon and Robert A. Young, comprising the firm of Condon & Young, Inc., of 357 So. Hill St., Los Angeles, Cal., have recently taken over the Southern California-Arizona territory for **U. S. Rubber Products, Inc.**, Electrical Wires and Cables.

Expanding its service and sales facilities, **General Controls Company** has opened a new division office in Detroit. It is located at 6432 Cass Ave. and is under the direction of A. F. Read, graduate engineer.

Wheeler Reflector Company of Boston has appointed Ernest Hail as its representative in Texas, with headquarters at Houston.

O. Z. Electrical Manufacturing Company, Inc. of Brooklyn, N. Y. has appointed F. W. Lemly of the Federal Engineering Company, 1037 National Press Building, Washington, D. C. to represent them in the Washington territory.

Wilson Lighting, Inc., of Chicago, has recently purchased the Ellicott Manufacturing Company, manufacturers of Ell-Strip wiring channel and accessories for show window, cove and lumiline lighting purposes.

Mr. Ellicott, former owner of the Ellicott Mfg. Company is now devoting his full time to his porcelain enameling business but will continue as a director of Wilson Lighting, Inc.

Insist on CERTIFIED RATINGS
Install AUTOVENT Ventilation

Certified Ratings
Member N.A.F.M.

"31 Series" PROPELLER FANS

This winter, when doors and windows are closed, dust and fumes must be removed! Proper ventilation is a necessity and every factory, store, laundry, garage, office, etc., is a live prospect! When you install AUTOVENT fans with CERTIFIED RATINGS you are certain they give satisfaction for years to come! Fan wheels will not churn air or overload motor! Wide range of sizes. Acid-moisture proof and Explosion proof as well as Bucket Wheel types also available! (Good profits! 50% list discount to contractors). Investigate! Get bulletins 200, 201, 202, 205.

AUTOVENT FAN & BLOWER CO.
1815-21 N. Kostner Ave., Chicago, Ill.

"The Complete line" of
FANS • BLOWERS • UNIT HEATERS

GEDNEY
Fine
FITTINGS

APPROVED GROUND FITTINGS
APPROVED FITTINGS OF ALL KINDS

Write for details

Sole Sales Agent

HERON ELECTRIC SALES CORP RCA BLDG NEW YORK

A WESTINGHOUSE SPECIFICATION MEANS LONG-TERM BUILDING INSURANCE

WESTINGHOUSE

"Straight across the board"

•

"Westinghouse throughout" gives full protection for architect and owner

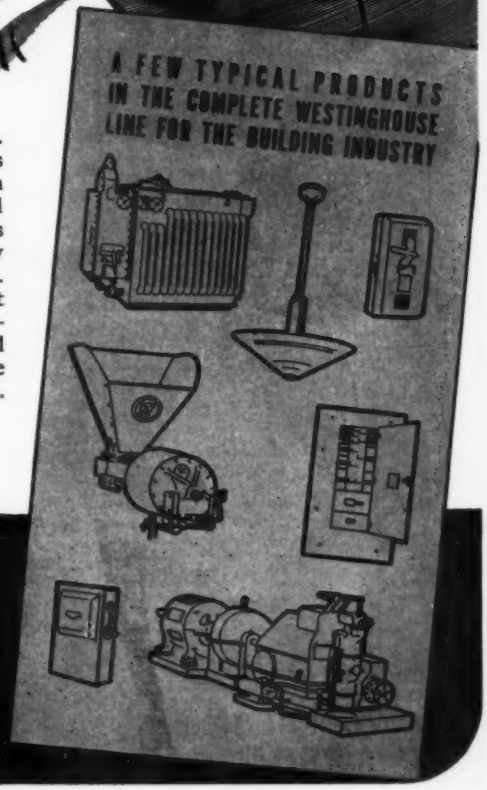
Work moves without a hitch when Westinghouse is specified. Westinghouse supplies every electrical product you need. Makes on-the-dot deliveries. Furnishes practical help as the work proceeds.

In no other building equipment is unit responsibility so vital. One electrical product usually depends upon many others for perfect functioning. With each unit playing its proper part the whole system makes good. Then, too, local Westinghouse service shops will always respond promptly to your calls in emergencies.

For co-operation "straight across the board" in electrical installations, call the local office or write Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

Ask for your copy of the Westinghouse Data Book, containing helpful information on electrical products for buildings.

J-98811-A



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TEST YOUR INSULATION THE WAY THEY DO AT THE N. Y. WORLD'S FAIR - - - WITH A MODEL "DM" MEGOHMER

Send for your copy of Bulletin 172WF describing the instrument

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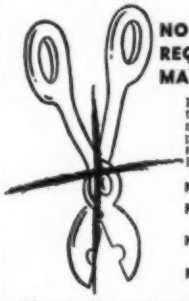
ILSCO

SOLDERLESS CONNECTOR



NO SPECIAL TOOLS REQUIRED TO MAKE CONNECTION

ILSCO solderless connectors eliminate need for special tools, thereby providing faster, permanent connections. Other ILSCO features:

NO set-screw contact . . .

NO flattening or separating of stranded wires

NO limitation to one size wire . . .

NO shearing effect whatsoever . . .

NO need for you to search any longer for the PERFECT Solderless Connector . . . WE HAVE IT! Six Sizes Take Care of All Wires from No. 14 to 1,000,000 C.M.

FREE—A large display board bearing mounted samples of ILSCO lugs. Address Dept. EC

ILSCO COPPER TUBE & PRODUCTS, INC.

5629 Madison Road, Cincinnati, Ohio

Oaks from Acorns

When the Jay Electric Co. sent out a letter to its Detroit customer list describing its special service on small tool work, the following items appeared in print at the side of its letterheads: rewinding, electric motors, generators, armatures, fields, hicycle stators, electric tools, drills, screwdrivers, polishers, sanders, nut runners, grinders, portable saws, spot welders, arc welders, butt welders, brake coils, contacting coils, relay coils, transformers, magnetic chucks, drill chucks. Doing these small jobs has required a forty-man crew in the Jay shop.

STICKLER FOR CERTIFICATION—Southern California is going places with certified adequate wiring. One of the reasons for A/W progress is Walter L. Stickel, director of the department of adequate wiring, Electrical Development League of Southern California, shown here presenting A/W certificate No. 1 of the Los Angeles area to a proud "Missus" in her spic and span all-electric kitchen.

Shop Training Costs

Good service shop mechanics represent a sizable investment, according to E. F. Nelson of the I. R. Nelson Co., Newark, N. J. Several years ago a checkup was made of various mechanics who came up through the shop's departments. Figuring that only one man in five "stuck", the cost to train the permanent workers figured about $2,500 per man.

Service Cleanup

Some old structures are "service poor" like the Northampton County Court House and jail at Easton, Pa. Here there were three separate services for lighting and two for power. The H. N. Crowder Jr., Co., carried through a cleanup job to replace all five with a new 600-amp. three-phase four-wire master service. It means an $1800 modernization job for Crowder and reduced power bills for the county. Any such relics in your town?

The easiest way to get ahead in electricity—

through the other man's experience as found in books

Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

Terrell Croft's

AMERICAN ELECTRICIANS' LIBRARY

(6 volumes—over 3,000 pages—fully illustrated)

In six really magnificent volumes this library gives the most thorough, most complete and easiest-to-understand treatment of the more specialized phases of electrical practice in print today.

"How" and "why" for Maintenance Men

The books show the best ways to make installations for every type of conduit wiring job—they tell how to handle every kind of lighting and switch problem—they give tips on shortcuts for saving time on routine jobs—they show the quickest and surest methods of locating and remedying circuit troubles. Alternating current armature winding, electrical machinery control diagrams and machinery erection are some of the things covered in detail.

Diagrams

In all, these books contain more than 1,000 clear, easy to follow diagrams, with wiring instructions written in simple language. It is unnecessary to tell you how valuable is this one feature alone.

Small monthly payments

You may examine these books for 10 days by sending the coupon below, filled out. In addition, if you decide to keep the books you have the privilege of paying for them in easy monthly installments while you use the books. Make sure you are not passing up your best bet for getting ahead. Mail the coupon today.

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Send me Croft's American Electricians' Library, 6 volumes, for 10 days' free examination. If I find the books satisfactory, I will send you $1.50 in 10 days, and $2.00 a month until $17.50 has been paid. Otherwise I will return the books postpaid.

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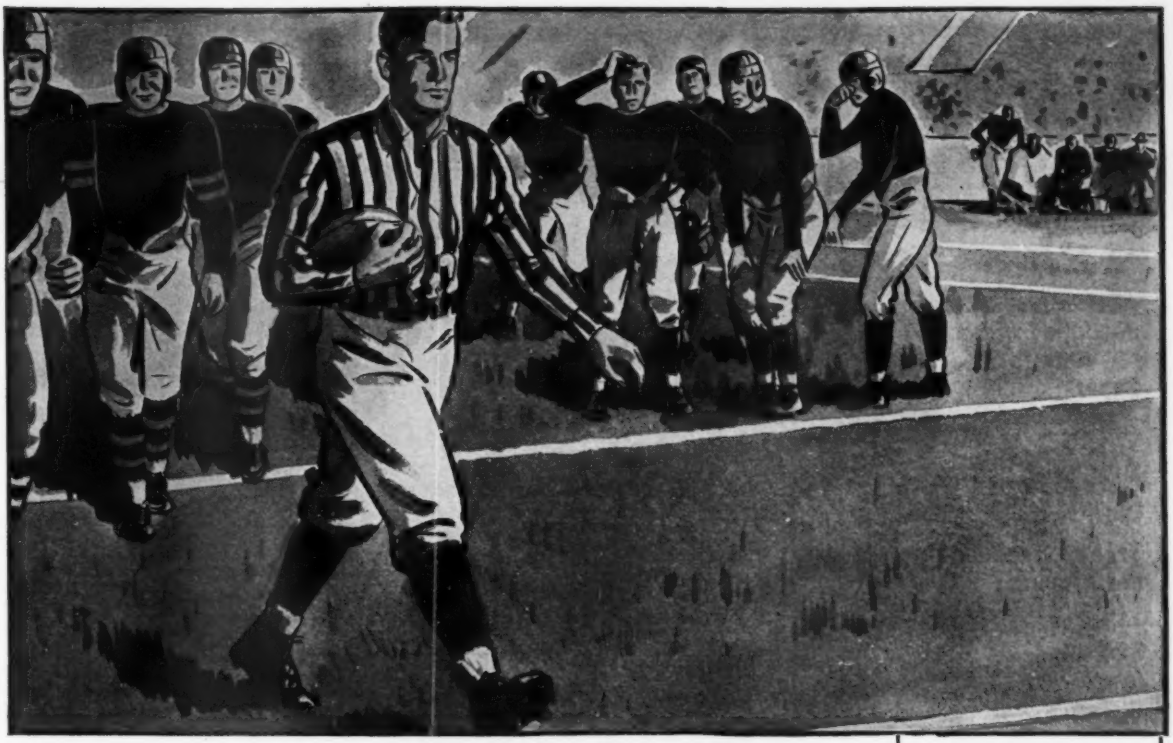


UNNECESSARY PENALTIES ARE COSTLY

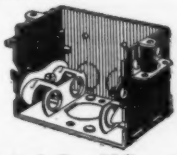
● Whether the "off-side" penalty is five yards on the gridiron, or a 5% loss in business, it often makes the difference between success and failure. Trying to force, into the job, materials which do not have acceptance nearly always causes an "off-side" penalty.

You can easily and satisfactorily eliminate the possibility of such losses by the continued use of RACO • ALL-STEEL • PRODUCTS. The approval and preference which these products have won, over a period of years, can be counted on to help you make bigger profits month after month.

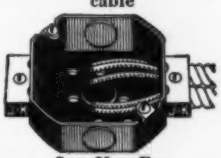
Engineered to meet modern wiring requirements, RACO • ALL-STEEL • PRODUCTS provide absolute dependability on every job. Complete satisfaction is assured by the total of more than 40 years of experience behind the switch boxes, outlet boxes, cutout boxes, cabinets, fuse cab and conduit fittings which bear the famous RACO and ALL-STEEL trade-marks.

Adequate stocks are maintained by wholesalers in all parts of the country. Write for catalog and complete information. There is no obligation.

A few of the products in the complete RACO • ALL-STEEL • PRODUCTS line:

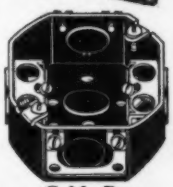


Switch Box MC—with XL clamps for armored cable



Jay-Kay Box DO-25 N-JK—refined J-K clamps on outside provide more wiring room

Switch Box MF—for cable, with adjustable fixture bridge



Cable Box DO-22N-OE—equipped with external mounting ears

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SWITCH BOXES • OUTLET BOXES • CUTOUT BOXES
CABINETS • FUSE CABS • CONDUIT FITTINGS

VICTOR
"FORCE AIR"
EXHAUST FANS

Complete Line
6" to 28"

★ ★

Equipped with
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Motors

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Rugged
Construction

Trouble-free
performance

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Special
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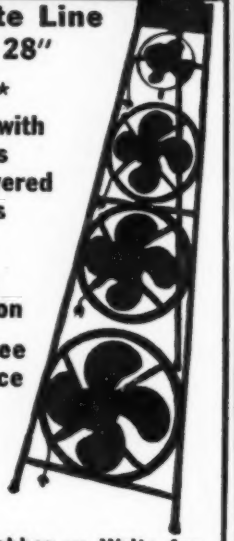
Prices!



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CUSTOMER'S LAYOUT SHEETS
as sales tools?

● Since its appearance in March, 1938, ELECTRICAL CONTRACTING, thousands of reprints of this form are being used by contractors. Reprint consists of a layout sheet on which you can draw wiring diagrams to submit with your bids. List of wiring possibilities included. Sample sheet sent on request.

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Electrical Contracting
330 W. 42nd Street, New York

Send me — reprints @ $4.00 per 100, for which payment is enclosed.

Name .....

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Shopman's Creed

At the Stearns, Perry & Smith service shop in Boston a wall sign cites a sales creed covering three timely points—

1. Determine definitely what you have to sell.
2. Develop yourself to present your product honestly and truthfully.
3. Present it with evidence to support your claims.

Motor Man's Truism

In Detroit, where things change so swiftly in building automobiles, this little office note of wisdom comes to light—"We get too soon old and too late smart". We found it while visiting the office of Marshall G. Pearce, president of the Electrical Repair Association.

NECA DELEGATES from new Rochester Chapter, Secretary-Manager Bill Quinlan and Treasurer Frank Farrestat.

Fleet Operations

To serve its widely scattered jobs throughout thickly populated Westchester County, the Whiffen Electric Co. of White Plains, N. Y., operates ten trucks.

Contractor Hobby

Gerald G. O'Brien, an electrical contractor of St. John, N. B., applies his electrical experience to a hobby that makes his spare time services useful to the community. When a dramatic club was organized in his parish, O'Brien took on the job of providing and handling the electrical effects. This hobby has resulted in the Holy Trinity parish center stage being one of the best equipped in the St. John zone, and Mr. O'Brien has become an important worker in community dramatics.

GREETERS—Ray Thayer of St. Johns, Mich. and C. C. Cadwallader of Detroit sharing a private joke at NECA meeting.

Light Man's Slogan

The Trenton, N. J., shopping area bears frequent evidence of recent lighting modernization by Sharlin Bros. Electric Co. And why not, since this convincing slogan appears in gold letters on the company's neat display windows—"Brighten the Nites with Sharlin Lites".

Industries Respond

The Everson Electric Co. of Allentown, Pa., makes industrial surveys as an everyday chore. This work covers motor drives, power factor correction, transformer station loads and general maintenance problems. Four sales engineers are kept out on the firing line scouting for new problems to solve.

Low Cost Lines

A rural line project, centering in Curry County, New Mexico has been constructed at a cost of $550 per mile. This compares with $1,500 to $2,000 per mi. in other areas, before the advent of REA, and average costs of just under $950 per mile on most REA financed projects. This line, as well as others in the South, is inexpensive to build because it is largely single-phase construction, the terrain is open and favorable, and there is little likelihood of sleet. The experience, however, is considered by REA to be encouraging to the advance of rural electrification throughout the country.

Blue Eagle Reminiscence

H. R. Wickersham of Allentown, Pa., looks back to NRA days with sincere regrets. At the Wickersham Electrical Co. office, that familiar Blue Eagle poster hangs in a prominent place, bearing this added lettering: "Lest we forget this blunder. Died friendless 2 pm May 27th, 1935."

UMI

READ WHAT THESE ORACLES SAY ABOUT . . .

Private Interior Telephone Systems

"A gaze into my crystal ball
Shows need for 'Intercoms' by all
In office, shop and household, too,
All these mean greater wealth for you."

"In stars above I do preceive
That you are fated to receive
Great profits if you'll really sell
These 'Intercoms' for fare thee well."

"Now, I'll predict your destiny
As seen by numerology
If 'Intercoms' you will provide
Your profits will be multiplied."

SOOTHSAYERS or no soothsayers, there is money to be made from intercommunicating telephone systems — 'Intercoms' for short — and you can be making it!

Just for a start, take your present accounts. Practically every one is a prospect for private interior telephone systems and they naturally look to you as the logical supplier of this equipment. Sell them and others too — we'll help you!

Automatic Electric, for over 40 years manufacturer of both public and private telephone equipment, makes a type to suit every requirement. Four styles appear below.

Our field representative will gladly supply you with literature, prices and discounts, and work with you on specific jobs. Call on him.

SERV-U-FONES

Inexpensive common-talking systems in capacities of two to ten stations. Conveniently packaged, attractively priced, simple to install. Dry cell operated.

AUTO-COMS

Deluxe dial type intercom systems, providing selective talking and selective signaling service for a maximum of ten stations, permitting as many as five simultaneous conversations. Require no automatic switchboard.

INTERCOMS

Common-talking, selective-ringing systems in capacities of two to eleven stations. Beautifully designed, and durably constructed for long faithful service. Operate from dry cells or battery eliminators.

P-A-X

Private Automatic Exchange systems in capacities of ten lines to a thousand—or more. Use standard automatic telephones and provide for special communication services such as Code Call, Conference, Executive Priority, etc.

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

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EQUIPMENT News

Adjustable Sheave

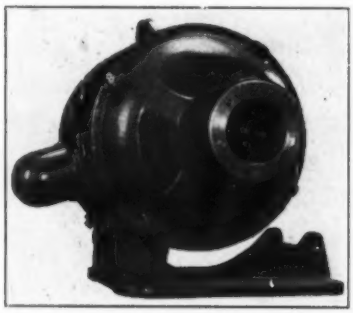
An adjustable Texsteel sheave with a range of pitch diameter varying from 2 in. to 3 in. and from 3 in. to 4 in. by removing an adjustable plate, reversing, and again placing on the hub. Developed to meet the demand for a sheave low in cost with a wide range of speed variations. Especially suited to the heating and ventilating industry. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ALLIS-CHALMERS ADJUSTABLE SHEAVE

■

Pivot Mounted Motors

A new Burke pivoted motor is designed for short center V or flat belt drive. Pivot mounting automatically keeps belt tension in proportion to the load and takes care of normal belt elongation without manual adjustment. The pivot is mounted in bronze bushings. Base is slotted for belt adjustment at time of installation and no other base is required for horizontal mounting. Burke Electric Co., Erie, Pa.



BURKE PIVOT MOUNTED MOTORS

BENJAMIN SILVERED BOWL DIFFUSER

Silvered Bowl Diffuser

A new RLM reflector designed to utilize the indirect lighting characteristics of the silvered bowl lamp. Combines a porcelain enamel reflecting surface with a semi-specular alzak aluminum reflector insert. The insert, located in the top, redirects the light from the silvered bowl lamp downward and outward, avoiding interception of the light rays by the lower edge of the porcelain reflector. Filament is shielded from all normal angles of vision. Available in socket reflector and turnlox type of hood construction. Benjamin Electric Mfg. Co., Chicago, Ill.

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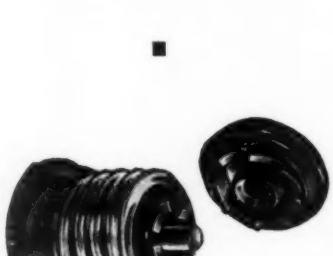


SHAWMUT TAMRES PLUG FUSE

Plug Fuse

A new tamper-resisting fuse, Tamres, to meet the requirements of local codes specifying tamper-resisting protection for circuits. Tamres fuses have Edison screw shells and the adapter remains permanently secured in standard screw shell cutout bases. No changes in existing cutout bases are necessary. Can be used either with or without adapter. Without adapter they resemble regular plug fuses and can be used as such; with the adapter they become tamper-resisting. The Chase-Shawmut Company, Newburyport, Mass.

G. E. WOUND CORE TRANSFORMER

Wound Core Transformer

A wound core distribution transformer with core construction of two continuous strips of low silicon content cold rolled steel. Tightly wound into two metal rings through and around the coils. The coils are oval in shape and of short axial length interleaved in secondary, primary-secondary arrangement. This construction eliminates the cutting and placing of hundreds of separate pieces of steel that make up the core of the conventionally designed transformer. Units of 1½, 3 and 5 kva. have been produced in voltage classes of 7620 volts and below. General Electric Co., Schenectady, N. Y.

■

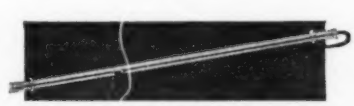
Voltage Controller

A recently developed controller for low voltage high amperage generators, where a very close control of the voltage is required. Replaces the standard field rheostat and separate exciter particularly for laboratory use. On a 6-volt generator, where it is frequently required to use voltages between 0 and 6 volts, the operator can set the voltage at any point within 1/16 of a volt. Columbia Electric Mfg. Co., Cleveland, Ohio.

■

Trol-E-Duct Sets

Handy sets of Universal Trol-E-Duct are now packaged to be installed to provide a ready source of light and power in all kinds of commercial establishments. Set includes a 5-ft. Duct section enclosing two busbar conductors, supporting hangers, a 5-ft. cord with attachment plug and movable trolley collector or semi-fixed plug for insertion in duct and into which lights, tools or other electrical appliances can be wired or plugged. Additional plugs, trolleys and other auxiliary fittings for use with the set, may be added. Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit, Mich.



BULL DOG HANDY SET

Explosion-Proof Hand Lamps

Two styles of explosion-proof hand lamps. Type EVHS is a compact trouble light with tubular, heat resisting glass globe and small, heavy cast guard. Measures 3¼ inches in diameter, 14 inches in length and takes 25-watt T-6½ clear lamp. The type EVBL is tubular with a slotted opening guard for insertion into bung holes 2¼ inches in diameter and larger. Overall length is approximately 32 inches. For oil refining and alcohol distilling industries. Appleton Electric Company, Chicago, Ill.

APPLETON HAND LAMP

■

Drill Point

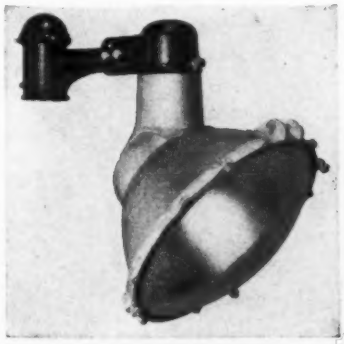
A new rotary drill point named "Sudden Depth" is designed for drilling holes in concrete, tile, brick, glass, marble, cast iron and glazed finished materials. Tipped with carboloy and unaffected by high temperatures or heavy pressure. May be reground an aggregate of 20 to 30 times on a silicon carbide grinding wheel. The Paine Co., Chicago, Ill.

PAINE SUDDEN DEPTH DRILL

■

Hinged Door Floodlights

A line of dust-tight and moisture-proof floodlights for outdoor service. A hinged, cast aluminum door permits easy maintenance and relamping. Spun reflector of Alclad aluminum treated by alzak process and available in wide or narrow beam. Socket housing is heavy cast aluminum, attached by four bolts, and a steel reinforcing cup. Galvanized steel cross arm mounting. Bases available for slip fitter, pipe clamp or flat surface mounting. Lenses are heavy stippled, heat resisting glass, available from 300 to 1500 watts. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE FLOODLIGHTS

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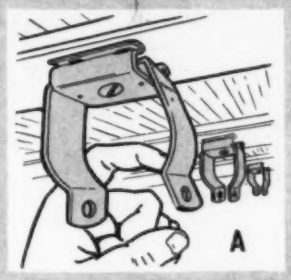
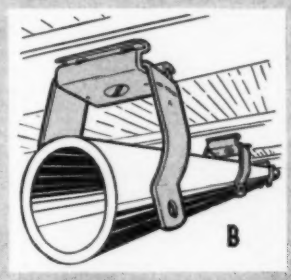
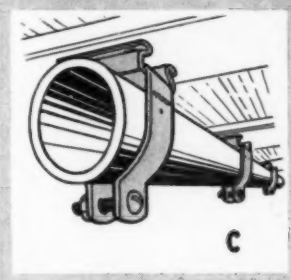
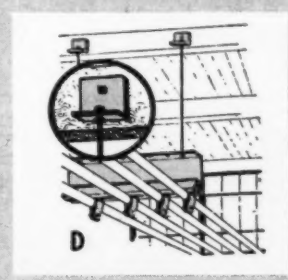
WASTED MOTIONS AND NEEDLESS COST *with the*

CLEVELAND CONDUIT HANGER









After all's said and done, what *you*, as a contractor, are *most* interested in are ways and means of saving time and money on the job! So, while we could say a lot about the neater appearance which the new *Cleveland Conduit Hanger* gives every finished job on which it is used, let's get right into the subject of quicker, easier, less *costly* installations . . . a feature of this new device which, more than anything else, gives it its tremendous appeal to contractors who have already used it.

EXAMINE THESE ADVANTAGES:

1. The required number of clamps can be set before conduit is actually hung, as shown in figure A. This makes it unnecessary to handle too many units.

2 Pre-assembled runs of conduit can be hung loosely from the clamps in one preliminary operation, as illustrate in figure B.

3 After conduit is run, clamps can be tightened with single screw, as shown in figure C, thus giving a true, straight, rigid, completed job.

4. Parallel groups of pre-assembled conduit can be hung from *Cleveland Conduit Rail*, as pictured in figure D.

5. A complete stock of *Cleveland Conduit Hanging Equipment* suffices in hanging any type of wiring job. Extra fittings, brackets and temporary work are eliminated.

Write Today...

for full information on this innovation in conduit hanging . . . and its economical, efficient use in making your work more profitable!

THE CLEVELAND SWITCHBOARD CO.

2927 EAST 79th STREET CLEVELAND, OHIO

UMI

EQUIPMENT News

[FROM PAGE 81]

Box Cover Switch

A shallow bodied, back mounted, outlet box tumbler switch. Compact bakelite body 1$\frac{7}{32}$ in. deep, 1$\frac{31}{32}$ in. long and $\frac{31}{32}$ in. wide. Available in single-pole and three-point types for 3$\frac{1}{2}$-in. and 4-in. box sizes. The Bryant Electric Co., Bridgeport, Conn.

BRYANT BOX COVER SWITCH

■

Sign Lighting Reflectors

A new reflector designed for close-up illumination of emblem signs, posters, walls, from below. Extending only 20 in. from the base of a 6 ft. circular sign, the "Closelite" delivers almost uniform illumination from the bottom to the top. Reflector does not appear in the field of the sign when the observer is at a distance greater than 15 ft. Made in several styles and sizes with water tight porcelain enameled reflector with a glass lens. Goodrich Electric Co., Chicago, Ill.

GOODRICH CLOSELITE REFLECTOR

■

Insect Trap

A new light trap for night flying insects with capped bottom opening for easy removal of dead insects. Consists of diffusing glass globe having its sides pierced with three funneled slots leading to the light bulb and uses a 100 or 150 watt lamp. In operation light attracts the insects and the superheated air exterminates them. Available with ceiling holder for permanent installation or with attachment fitter for attaching to ordinary light sockets. The Miller Co., Meridan, Conn.

MILLER LIGHT TRAP

■

Motor Starters

Two new manual across-the-line type motor starters with thermal overload protection and push button operation. Silver-to-silver butt type contact and depression in cover to prevent accidental contact. A.C. automatic across the line type starter with thermal overload protection, push button operation and three point selector switch. Ward Leonard Electric Co., Mt. Vernon, New York.

WARD LEONARD STARTER

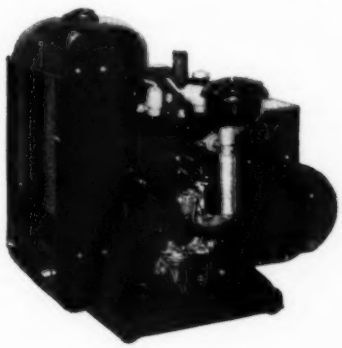
■

Luminous Tube Lighting

A new system of neon tube lighting for the advertising sign and display field uses gas filled tubes energized by a source of high frequency radiation. Electrodes, external wiring, blocked out sections and insulators are eliminated. Lustron light signs are made in the normal letter form without cross backs, each letter forming a separate unit. This feature permits changeable lettering in neon tubing. The system consists of electrode-less tubes shaped into a letter or character, the energizing strip for power radiation, and the power packs. The power pack is a radio frequency oscillator built in a compact container unit in various sizes for different requirements. Lustron Light Inc., 114 East 32d Street, New York.

Electric Plants

Two models of a.c. gasoline engine driven, water cooled, generating plants in 2,000 and 3,000 watt rating. Powered by two cylinder, four cycle engines operating at 1,800 r.p.m. and producing 110 volt, 60 cycle a.c. current at closely regulated voltage and frequency. Also produces 12 volt d.c. for starting battery charging at adjustable rate up to 150 watts providing limited amount of power for radio or emergency use. All accessories and adjustments at one side of plant for convenient service, mounting base equipped with vibration absorbing rubber bushing. Available in manual, self starting and full automatic types and complete with starting batteries, fuel tanks and other essential parts. D. W. Onan & Sons, Minneapolis, Minn.

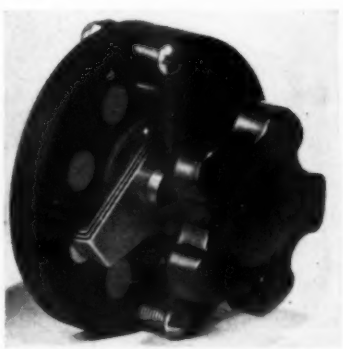


ONAN ELECTRIC PLANT

■

Rotary Switch

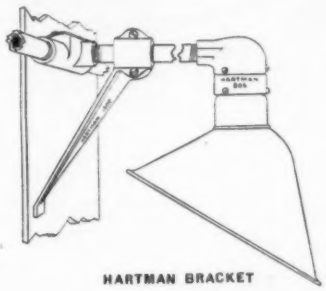
An eight point current control switch of 30 ampere capacity. A laminated contact arm secured to a bakelite shaft riding in ball bearings wipes over molded-in $\frac{1}{2}$-inch brass contact. Mechanism is enclosed in air excluding housing which may be ganged to operate from a single operating handle. Single unit types are 4 inch outside diameter and 2$\frac{1}{4}$ inches from front of handle to back cover of switch. Three gang switch same diameter and 5$\frac{1}{4}$ inches overall length. Kneisley Electric Co. Toledo, Ohio



KNEISLEY CONTROLLED SWITCH

Sign Light Bracket

A bracket designed to support conduits extending out from building walls, sign boards and other similar uses. The bracket consists of a conduit clamp with a bracing arm at a fixed angle. The clamp is tightened to the projecting conduit and the arm allowed to rest against the wall. Sliding the bracket on the conduit one way or another will raise or lower the conduit for setting the proper angle for best results. Made in two sizes for ½ and ¾ inch conduit. B. Hartman, Long Beach, Calif.



HARTMAN BRACKET

■

Time Switch

A time switch for controlling heating plants. Will close and open electrical circuits in any combination of one hour or half hour periods. By inserting pins in the dial face it will operate automatically for a stated period throughout each 24 hours in conjunction with or entirely independent of thermostatic control. Automatic Electric Mfg. Co., Mankato, Minn.

AUTOMATIC TIME SWITCH

■

Switchboard Wire

A new switchboard wire, insulated with a synthetic compound that can be bent easily at sharp angles without damage to the insulation. Approved by Underwriter's Laboratories for switchboard and panel board wiring in 90 C. continuous operation. Insulation is impervious to water and moisture, oil proof and flame-retarding. It forms a seamless impregnable tube applied directly to the tinned copper conductor. High dielectric strength permits smaller overall diameter. Stocked in sizes from 16 to 8, larger sizes on order. General Electric Co., Bridgeport, Conn.

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11-38

A McGRAW-HILL PUBLICATION

EQUIPMENT NEWS

[FROM PAGE 83]

Safe-T-Fone

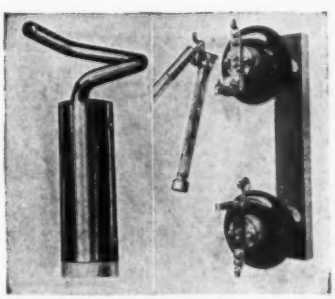
A telephone system known as the Safe-T-Fone for residential use. It tells the housewife who is at the door before opening. The equipment is sold as a package item consisting of a speaker type door phone with bronze face plate, a house phone, for kitchen or other convenient location. Flush wall handset type and 50 feet of braided cable takes care of average installation. S. H. Couch Company, Inc., North Quincy, Mass.

COUCH SAFE-T-FONE

■

Switch Stick

New safety switch stick with a patented hook consisting of a six-inch tempered steel rod bent into a spiral for pulling, grasping and carrying. Disconnect switches, cut-out tubes and fuses may be opened, removed and replaced without danger of the hook slipping off. The hook is twisted through the disconnect blade, cut-out or fuse ring, and grips it with positive control. Provided in station and line work types. The latter are extra light in weight and have sectional extensions. The 3½ ft. section carrying the hook is furnished with a belt ring for attaching to lineman's belt. Schweitzer & Conrad, Inc., Chicago, Ill.



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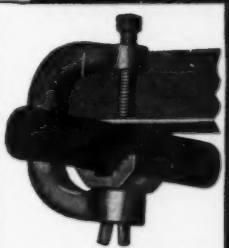

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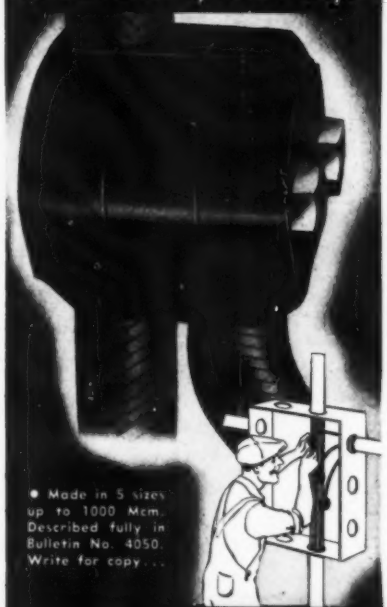

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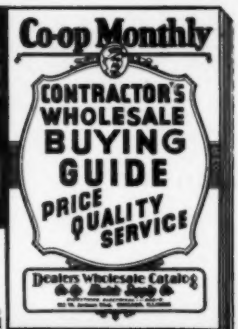

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Of Electrical Contracting, published monthly, at Albany, N. Y., for October 1, 1938.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared D. C. McGraw, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electrical Contracting, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, N. Y. C. Editor, Earl Whitehorne, 330 West 42nd Street, N. Y.C. Managing Editor, none. Business Manager, Glenn Sutton, 330 West 42nd Street, N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N. Y. C. Stockholders of which are: James H. McGraw, 330 West 42nd St., N. Y. C. James H. McGraw, Jr., 330 West 42nd St., N. Y. C. James H. McGraw, James H. McGraw, Jr., and Curtis W. McGraw, Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw: Curtis W. McGraw, 330 West 42nd St., N. Y. C. Donald C. McGraw, 330 West 42nd St., N. Y. C. Anne Hugus Britton, 330 West 42nd St., N. Y. C. Mildred W. McGraw, Madison, N. J. Grace W. Mehren, 33 West Grand Ave., Chicago, Ill. J. Malcolm Muir and Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 524 Fifth Avenue, N. Y. C. F. S. Weatherby, 271 Clinton Road, Brookline, Mass. Elsa M. Wilsey, Madison, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is. (This information is required from daily publications only.)

D. C. McGRAW, Secretary.
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 26th day of September, 1938.
[SEAL] H. E. BEIRNE.

Notary Public, Nassau County. Clk's No. 84. N. Y. Clk's No. 98, Reg. No. 0-B-90.
(My commission expires March 30, 1940)

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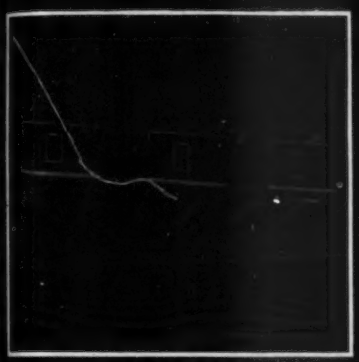

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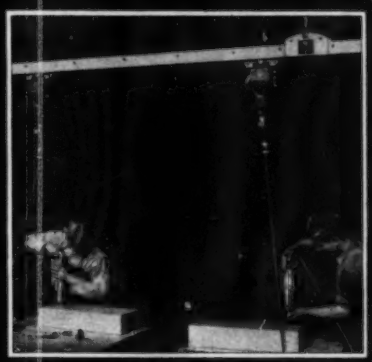

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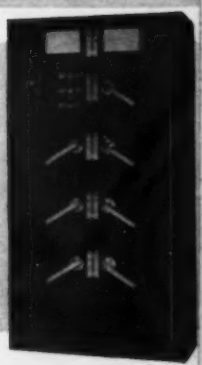

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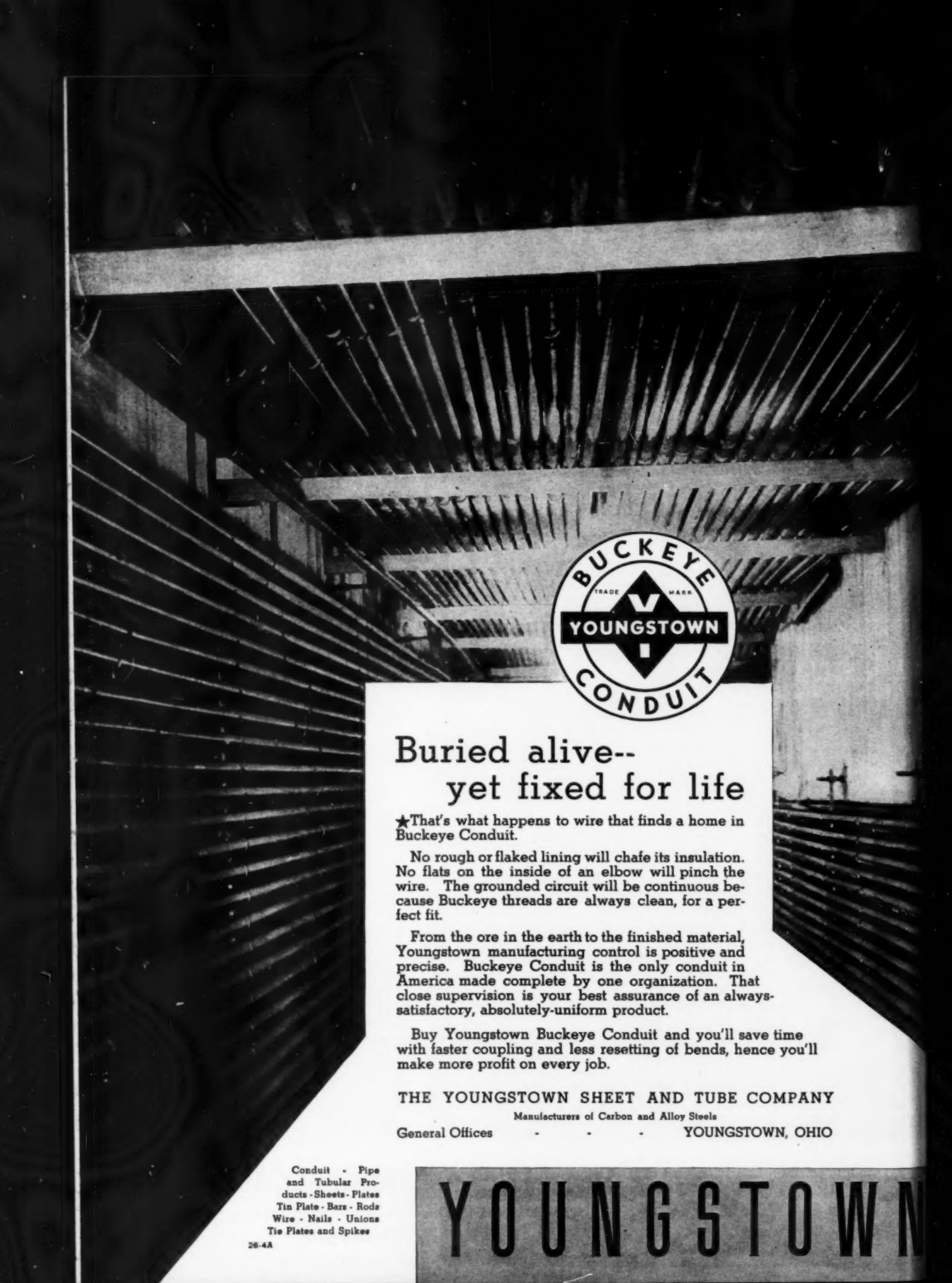

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